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All communications to the Editor, 22 Harlington Road East, Feltham, Middlesex, England. Telephone Feltham 3740.

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NOTES & OBSERVATIONS

INTERESTING MACRO-LEPIDOPTERA IN MIDDLESEX IN 1956

Each year a certain number of interesting species turn up in the mercury vapour trap in my garden at Feltham. In spite of the fact that pressure of work prevented me from starting 'trapping' before the beginning of July, this year has been no exception. The following records are of a few species which are unusual in the district and notes which are supplementary to the extremely interesting and valuable papers '*The Moths of London and Its Surroundings*', by C. G. M. de Worms, being published in the *London Naturalist*, the Journal of the London Natural History Society.

Hydraecia nictitans (Borkh.). This is always fairly common but usually in less numbers than *H. paludis* Tutt.

Caradrina taraxaci Hübn., common this year (not normally a common moth here).

Caradrina ambigua (Schiff.), de Worms says 'very common at Feltham in 1953 and 1954 (Classey)'. In fact this insect is always common here. It regularly has two broods each year and during the emergence periods is normally the commonest moth in the trap.

Leucania straminea Treits., 1 male specimen 9th July. de Worms quotes only very old Middlesex records. This is the first time I have seen the moth in Feltham, but there is still a good deal of

suitable ground and I would be surprised if it was not a regular inhabitant.

Amathes ditrapezium (Borkh.), 1 male specimen on 6th August. This is a surprising record. de Worms gives no Middlesex records.

Drepana binaria (Hufn.), *D. falcataria* (L.), and *D. lacertinaria* (L.). A few of each of these three species come to the trap each year.

Earias clorana (L.). A few each year. de Worms gives only old Hammersmith records for Middlesex.

Bena prasinana (L.), and *Pseudoips bicolorana* (Fuessl.), both occur in small numbers each year.

Arctia villica (L.), one or two specimens in most years.

Eilema griseola (Hübn.), 2 specimens 11th August. A few specimens appear every year. de Worms gives only a very old Middlesex record.

Bupalus piniaria (L.), 1 female 16th July. A surprising moth to find in this district, but one or two turn up most years.

Zygaena filipendulae (L.), 1 specimen on flowers in the garden 7th August. A surprising record in this built-up district and the first specimen I have seen here. de Worms quotes an old record from Isleworth and almost the whole of S.W. Middlesex must have been a very suitable habitat in the past before bricks and mortar took their toll. There seems to be no reason that it should not hang on on Hounslow Heath and other similar areas.

In conclusion it should be said that the foregoing notes are simply random and do not attempt any systematic additions to de Worms's excellent list. It is to be hoped that time will later permit of this —and I would enter a plea to all of the many lepidopterists who live within the 'London area' of de Worm's definition (a radius of twenty miles from St. Paul's Cathedral) to put on record any information additional to that contained in the list so that a reliable picture may be painted on what is at present a well-prepared canvas.

12th August, 1956. E. W. CLASSEY.
Feltham, Middlesex.

EARLY RECORDS OF MOTHS AT THE START OF THE EXCEPTIONALLY EARLY SPRING OF 1957

The early start of the spring in 1957 is so phenomenal that it may be worth while to place on record the first few exceptional records from the M.V. light trap in my garden in Feltham.

24th March, *Mamestra brassicae* (L.); 28th March, *Cucullia chamomillae* (Schiff.); 4th April, *Caradrina clavipalpis* (Scop.); 10th April, *Cycnia mendica* (Clerk); 18th April, *Hadena chenopodii* (Schiff.) (*trifolii* (von Rott.)), (L.) *Agrotis puta* (Hb.), *Apatele rumicis* (L.); 19th April, *Cerura vinula* (L.).

Feltham, Middlesex. E. W. CLASSEY.

WOOD WALTON FEN NATIONAL NATURE RESERVE

By ERIC DUFFEY

WOOD WALTON Fen in Huntingdonshire, long famous to the botanist and zoologist, was leased to the Nature Conservancy by the Society for the Promotion of Nature Reserves in 1953 and declared a National Nature Reserve in March of the following year. An Advisory Committee was set up consisting of members nominated by the two organizations and joint action taken to restore fen conditions and arrest bush development.

The most urgent tasks awaiting the Committee's consideration concerned three main items:—(a) improving the water regime by raising the water table and restoring and controlling the flow to the various sections of the Reserve; (b) halting the advanced bush colonization by clearance in stages; (c) the development of long-term floristic and faunistic studies to record the changes taking place as a result of (a) and (b).

The water system on the fen is entirely artificial and is dependent for its source on rainfall and the periodic overflow from the lateral drains of the external system. Its water supply is therefore rather more precarious than that at Wicken Fen, which is derived from an upland source, and at Chippenham, which is a valley fen fed by springs. Prior to 1953 most of the numerous drains which crossed the Fen were overgrown and choked with vegetation and there were few effective dams to prevent water loss.

The accompanying sketch-map illustrates the dyke system on the Reserve indicating those which are overgrown and those which have been recently dug out. In addition, symbols mark the positions of dams and sluices, peat cuttings and the area of special vegetational interest. In 1951 and 1952 a detailed botanical study of the Fen was made by Dr. M. Poore, and he found that most of the acid peat which formerly covered all or most of the Reserve had been cut away in the course of time to meet the demands of 'turf' as fuel. Only a limited area now remains, mainly on the southern half of the Fen, where acid or 'red' peat can still be found. Elsewhere an alkaline fen peat was exposed and the flora which has developed on this is of less interest and normally distinct from that on the 'red' peat.

Work was commenced first of all in the southern part of the Reserve by cleaning out dyke 10 and its connection to dyke 11. Where the latter meets the Great Raveley Drain and the former, Wheatley's Drain (external drains forming the east and west boundaries respectively), concrete dams were built with wheel-valve sluices, making it possible to control the water flow in this system. In succeeding winters further essential dykes were dug out and more wheel-valve sluices in-

stalled, enabling a water supply to reach the most important sections of the southern third of the Fen.

Last winter work was completed on the dyke on the south side of the Reed Field and in the dyke by Stewart's drove (east side of Field 95). This means that when water enters the fen from Wheatley's drain via dyke 10 it can be distributed over the major part of the southern half of the Reserve and held in chosen sectors by closing selected valves. Further dykes will be cleaned out in the coming winter to complete this phase of the work. (See sketch-map.)

The northern half of the Fen has at present had relatively little drainage work carried out on it, but an important step in improving its water supply has been taken by the installation of a dam and wheel-valve at the east end of Coleman's drain. Further work will make it possible to fill the open dykes on this part of the Fen and hold the water in without having to maintain an abnormally high level in Coleman's drain, which is part of the external system.

The conditions at Wood Walton emphasize the importance of preserving a network of open drains, controlled at strategic points, so that in times of drought there is an adequate reservoir of water available to penetrate into the peat, and in times of flood, excess can be shed rapidly. It is not possible or desirable to maintain a high water table throughout the year and it was probably a natural seasonal occurrence for such fen areas to dry out gradually during the summer. Our aim is to maintain a water table to within about 6 in. of the surface for approximately half the year and to retard the fall as far as we can during the summer.

It is not yet known whether the greatly increased area of water surface on the Fen has contributed to the entomological richness and comments on this point would be welcome from visitors. Two aquatic plants of special interest have recently been recorded, however: a rare hybrid pondweed, *Potamogeton fluitans,* and *Myriophylum alterniflorum,* for which the only previous Huntingdonshire record is an unlocalized one for about 1830.

In connection with the raised water table a number of peat cuttings were established in 1954 and 1955 measuring approximately 15 ft. x 77 ft., and in most cases they were dug out to two different depths. These excavations have been made in various parts of the Fen according to the type of peat and plant community present. A record is being kept of the colonizing flora appearing on the bare peat surfaces and interesting observations have also been made on the flora of the peat 'spoil', which was thrown out when the cuttings were constructed.

In other parts of the Fen, 10 x 10 metre quadrats have been marked out, and a record of vegetation change is being made by regular survey and observation. Having carried out a major reorganization of the water system, it is important that we should trace the effect this will have on the flora and fauna. Visitors can help considerably by submitting records or observations on any new or inter-

esting plants and animals which may indicate an improvement of fen conditions.

In 1936 Sir John Fryer published a paper on the Fen in the Society for the Promotion of Nature Reserves' Handbook of that year and he referred to the remarkable changes in the flora and the general appearance of the Fen during the thirty years from 1900 to 1930 approximately. At the turn of the century the Fen consisted mostly of reed and mixed fen vegetation (rough litter) and bush growth was very localized. In about 1910, after grazing and cutting had been discontinued, the litter and marsh grassland had been replaced by a pure stand of reed. Ten years later he records another visit, and further changes had taken place. The bush areas had steadily spread over the Fen, suppressing the reed and litter or confining this vegetation to small patches. This development of sallow carr has progressed since then, and to-day only a few small areas are free from bush growth.

Sir John records that these changes have been accompanied and probably accelerated by the gradual drying out of the Fen and that there has been a deterioration in the insect fauna. It is clear that fifty to sixty years ago the Fen had a much greater variety of habitats and plant communities than it has to-day, and the changes have led increasingly to uniformity. In about 1900 the Fen had woodland, sallow carr, reedswamp, mixed fen vegetation, and, as peat cutting was still being carried out, there would have been areas of bare and disturbed peat. The abandonment of traditional fenland usage, such as grazing, cutting of peat, reed and litter, and neglect of open waterways, has destroyed the varied pattern of habitats and in consequence the flora and fauna have become less rich.

It would be an over-simplification of the problem to say that we only have to recreate the 1900 conditions and the former richness of plants and animals will be restored. The changes which have taken place in the ecological pattern since that time are almost certainly very numerous, and of great complexity, but only the more obvious effects, such as bush growth and drying out, are apparent to us without detailed investigations. We must, in fact, acknowledge that small and long-term changes are going on all the time on any Reserve whatever the management policy, and our aim at Wood Walton must be to diversify the fenland biotope so that eventually we have the maximum range of habitats and plant communities which can exist in the special conditions found there. These will form a series from bare peat surfaces and open water to alder and birch woodland.

The problem of 'opening-up' the fen by removing bush growth is formidable in practice and needs careful thought from the biological point of view. Clearing is unpleasant and difficult work, and because a sallow bush is not killed by cutting it down with an axe, the major part of the root system has to be dug out. In very wet conditions the growth of sallow is discouraged, but it is unlikely that it will be possible to control bush development by this means at Wood Walton,

though a raised water table may help to delay re-establishment of carr over a cleared area.

Total clearance of sallow carr at Wood Walton Fen would take the present labour force several years, but in any case such action is neither desirable nor necessary. In many places the herb flora has been so depressed that clearing away all woody growth may, at this stage, result in rapid colonization by plants such as *Calamagrostis epigejos,* which already dominates large areas on the Reserve, rather than encourage the return of fen vegetation. Eventually it is hoped to raise the water table sufficiently to prevent the spread of *C. epigejos.*

Sallow carr, in its various forms, contributes a valuable range of habitats and types of fauna to the Fen, and for this reason examples must be preserved. Elsewhere we feel that clearance by stages is the best method with the object of creating and maintaining a mosaic of open areas fringed by bush growth, in which there is maximum variety in size, shape, degree of shelter, aspect and edge effect. This involves enlarging glades or clearings which already exist in the carr so that there is always a reservoir of fen plants available to colonize the newly cleared areas. Progress is bound to be slow, however, because the labour force has many other duties to carry out on this Reserve and elsewhere.

These clearings will have to be maintained by regular mowing or else woody growth will again invade them, and in some areas where *Rumex hydrolapathum* is encouraged for the Large Copper butterfly, care has to be taken to make sure these plants are not smothered by other vegetation.

Controlled burning as a tool to make bush clearance easier is regularly employed at Wicken Fen and a trial section of Compartment 94 (6 to 7 acres) was treated at Wood Walton this year. A light fire removes the dead herbaceous vegetation, making it more easy for the fenmen to get at the roots of the bushes, which must be dug out. It is important, however, that the use of this method is restricted to the winter months and that small areas only should be treated at any one time. The fire must be carefully controlled so that it does not develop a great heat.

There are substantial zoological objections to the use of fire on Nature Reserves because eggs, larvae and overwintering adults of numerous invertebrates found on the dead vegetation are destroyed. It is possible to compromise, however, by burning on a rotational system so that an adequate reservoir of animal life is preserved to colonize the burnt area in the following season.

Mowing and clearing as a regular routine is also necessary along certain rides and drains and in localized areas where rare plants are found. It has long been known at Wood Walton that certain plants are more numerous on some of the rides than elsewhere, and an enlargement of this habitat by widening the rides is being undertaken. Again in some parts of the Fen the newly excavated drains are too shaded

by surrounding bushes and trees to allow the aquatic vegetation to flourish and sunlight is being let in by clearing a wide margin along the dyke side.

It is clear from the foregoing that the East Anglian fens as they exist to-day cannot be described as natural formations, but are very largely man-made, in that their vegetation structure is a reflection of past land use, such as grazing, mowing, peat-digging and drainage. Many rare plants and animals have, in fact, been preserved because such traditional occupations maintained the optimum habitat conditions, and if such work cannot be continued substitutes must be found. Modern scientific management must take all these factors into consideration, but fortunately it does not tie us to a rigid concept of an idealized type of fen, because local practices and conditions varied from place to place as well as the extent of human 'interference'.

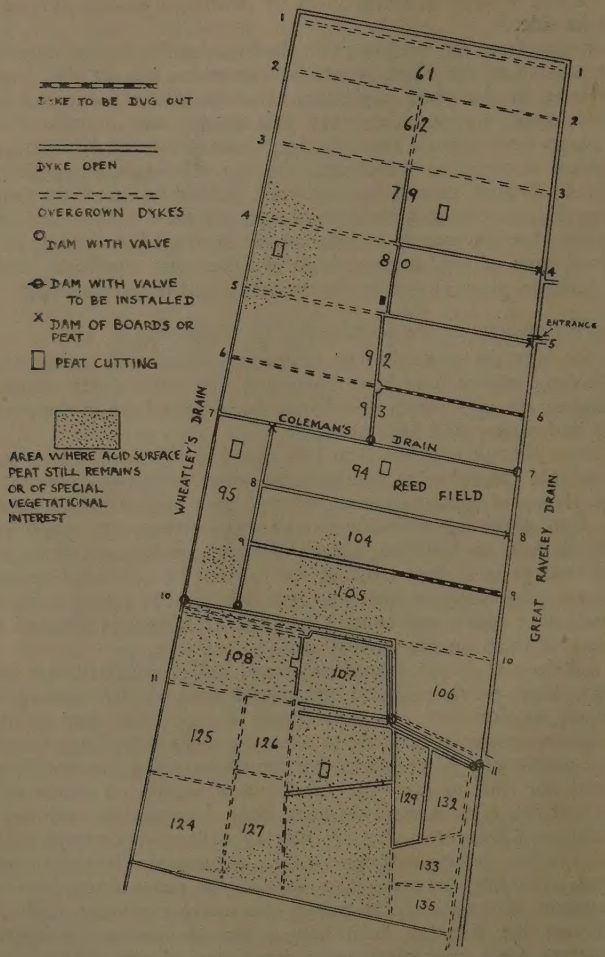
Recording changes in the fauna and flora on the Fen

So far only the more obvious techniques of scientific management of a fenland reserve have been mentioned, and much of this concerns catching up on work which would have been carried out in the past if labour and money had been available.

A more difficult problem is to look ahead and plan on a long-term basis so that the scientific management policy combines conservation of the plant and animal communities and their special habitat conditions, with particular attention to the requirements of certain rare species. In fact, no particular species of insect can be successfully preserved (except in a very artificial way) unless its ecological requirements are adequately understood, and this implies research on the associations of plants and animals in which these species live and the influence of them on the environment.

It follows that future management can only be carried out on a scientific basis providing there are enough data available about the ecological requirements and distribution of the plants and animals and their behaviour in response to changing conditions. Each Reserve poses a multiplicity of problems, but the Conservancy has neither the resources nor staff to carry out fundamental studies on conservation research of this type. A start has been made, however, by members of the Advisory Committee, who are helping with or supervising observations on the floristic changes within permanent 10 x 10 metre quadrats, recording the colonizing flora of the peat-cuttings and the development of aquatic vegetation in the newly excavated drains.

Although the Fen has been famous for its insects, particularly Lepidoptera, for a great many years, the biological information which has accumulated appears to be very little apart from the production of species lists. An increasing number of visitors to the Reserve are helping by submitting records of their observations to the Norwich office of the Nature Conservancy, but much more is needed before even the outlines of a picture of the fauna can be built up. So far this



WOOD WALTON FEN
Scale 3½″—1 mile

season, August 1956, 39 permits have been issued and three reports received.

A great deal of useful information probably lies in the notebooks of the many collectors who have visited the Reserve during the last twenty to thirty years, and knowing that readers of this journal are listed among them, I will outline below the information which is most valuable to the Conservancy. Future visitors to the Fen will also be making a useful contribution to the Reserve if they have a clearer idea of the Conservancy's requirements and are able to contribute notes. The following applies generally to all National Nature Reserves in East Anglia:

1. *Historical Notes*

   Collectors who have known the fen for many years may be able to describe the general appearance and vegetation of the Reserve, say forty or more years ago, and may be able to comment on the changes which have taken place as they remember them.

   We have a certain amount of information on those parts of the Reserve which were cultivated or dug for peat in the past, but we would be very glad to supplement this.

2. *Biological Notes*

   Although species lists are available for the Fen, very few comparative data appear to have been collected together recording changes in the fauna. Collectors who have known the Fen for many years will have information of this sort.

   Distribution and numbers

   The Fen is very conveniently divided into numbered and named sections by the network of dykes, and this should make it very easy to describe the distribution of the commoner insects. In fact, we have scarcely any information of this sort; the records reaching this office are nearly all unlocalized within the Fen. Changes in distribution and numbers may be one of the first obvious effects on the Fen animals of the improved water regime and cleared areas.

   The Habitat

   Entomologists cannot always be botanists as well, but it should be possible for everyone to describe in general terms the type of vegetation in which a particular insect was taken, *e.g.* Sallow carr, alder woodland, reed, mixed fen vegetation, dykeside, etc. This sort of information, together with the exact locality on the Fen and the date, is a definite contribution which, multiplied many times for a particular species, will enable us to build up a picture of the habitat and niche occupied by it on the Reserve. No distinction is made here between common and rare animals; information is required for them all.

The following example is an extract from a report received earlier this year, and, although short and concise, it covers all the information one is likely to require, *e.g.* description of habitat, and environment,

height, name of bush, locality on fen as well as the names of the Taxonomists who identified the material and the observer.

'Nest of *Lasius niger* (L.) (A.J.P. det. 1 ☿) under bark of vertical dry dead *Salix atrocinerea* (S.M.W. det.) stump, 3-4 ft., of which inner white-rooted wood had been riddled with what looked like galleries of *Meladrya caraboides* (L.), though beetle was not seen. Edge of path, sallow scrub, north end, Comp. 61.'

While an up-to-date species list is an essential part of the Reserve Record, which is a source of reference, it is clear that the scientific management policy can only be based on a detailed ecological knowledge of the fauna and flora of the Reserve. Until it is possible for scientific investigations to be carried out we must rely to a considerable extent on the records and observations of biologists visiting the Fen. The Conservancy would be pleased to hear from anyone who feels they could help on the lines suggested.

4th August, 1956

A WILD HYBRID OF *ERANNIS LEUCOPHAEARIA* (SCHIFF.) X *E. MARGINARIA* (BORKH.). LEP: SELIDOSEMIDAE

On 24th March, 1956, on the trunk of an oak tree in Trentham Park, Staffordshire, I took what at first I thought was a brownish male of *Erannis leucophaearia*. On examination, it seemed to have some of the characters of *E. marginaria* and was about intermediate in size between the two species. I showed the specimen to Mr. D. S. Fletcher of the British Museum; he sent it to M. Herbulot, the eminent French authority on the Geometridae, who confirmed that it was a hybrid *E. leucophaearia* X *marginaria*.

The forewings are ochreous-brownish strigulated fuscous, darker beyond second line; base hardly darker; first line slightly curved, median nearly straight, indistinct; second line fuscous, sinuate, but less markedly so than in *leucophaearia*; a fuscous discal mark touching second line; subterminal faint, whitish; terminal black dots. Hindwings pale ochreous, strigulated fuscous; second line and discal dot resting on it fuscous; terminal black dots. Abdomen pale ochreous with four dorsal pairs of black dots.

R. G. WARREN.

Wood Ridings,
32 Whitmore Road,
Trentham, Staffs.
8th April, 1957.

THE LEPIDOPTERA OF GLENAGEARY, Co. DUBLIN

By E. S. A. BAYNES, O.B.E., F.R.E.S.

Having collected lepidoptera at Glenageary, Co. Dublin, for about ten years, I feel that the publication of a local list might be of interest, particularly so, in view of the comparative paucity of Irish records generally.

Glenageary is a residential district some eight miles south-east of Dublin, on the south side of Dublin Bay; the Hill of Howth, on the opposite side of the Bay, being about six miles distant. The garden in which most of the insects have been obtained, is a little over half a mile from the sea. Apart from the numerous local gardens, some of considerable size, which doubtless support a fairly large insect population, there is, bisecting the whole area, a deep railway cutting, on the banks of which a variety of wild plants maintain themselves.

In spite of the mainly residential nature of the terrain, over 250 species of macrolepidoptera and Pyrales have been taken. This number includes the following 15 species of Rhopalocera: *Parage aegeria* (L.), *Dira megera* (L.) (both these species breed in a small secluded area of rough ground between the garden and the railway cutting), *Eumenis semele* (L.) (one example only; the nearest known colony is on the coast about three miles away), *Maniola jurtina* (L.) (occasionally seen), *Vanessa atalanta* (L.), *V. cardui* (L.), *Aglais urticae* (L.), *Nymphalis io* (L.) (one only; uncommon in this part of Ireland), *Polyommatus icarus* (Rott.), *Celastrina argiolus* (L.) (first brood only), *Lycaena phlaeas* (L.) (a few only), *Pieris brassicae* (L.), *P. rapae* (L.) (both only too abundant), *P. napi* (L.) (occasional), *Euchloë cardamines* (L.) (a few).

It will be seen from the following list of moths that the bulk has been taken since 1949, in which year a start was made with the use of mercury vapour light. To begin with a black 'Woods' glass lamp was used, hanging inside french windows overlooking the garden, but subsequently a M.V. moth trap with a plain glass lamp was installed. The list includes 16 new Co. Dublin records, and probably the most interesting item is the capture of a specimen of *Amathes ditrapezium* (Bk.), only once previously recorded in Ireland, about 100 years ago. Apart from the Pyrales at the end of the list, records of microlepidoptera have not been kept. The nomenclature adopted is that of Kloet and Hincks, Stockport, 1945.

SPHINGIDAE

Laothoe populi (L.). Frequent at M.V.
Smerinthus ocellatus (L.). One only, at M.V., 18.vi.56.
Herse convolvuli (L.). One only, at M.V., 24.viii.55.

Celerio galii (Rott.). Two at M.V., 18.viii.55 & 27.vii.56.
Deilephila porcellus (L.). Fairly frequent at M.V.
D. elpenor (L.). One only, at M.V., 19.vi.54.
Macroglossa stellatarum (L.). Occasional some years.

NOTODONTIDAE

Cerura vinula (L.). One only, at M.V., 24.v.55.
Pheosia tremula (Cl.). One only, at M.V., 20.vii.56.
P. gnoma (F.). Two at M.V., 15.vi.55 & 27.vii.55.
Notodonta ziczac (L.). One only, at M.V., 12.vii.56.
N. dromedarius (L.). A few at M.V.
Phalera bucephala (L.). Occasional at M.V.

POLYPLOCIDAE

Habrosyne derasa (L.) (*pyritoides* (Hufn.)). Fairly frequent at M.V.
Thyatira batis (L.). One only, at M.V., 26.vii.55.

LYMANTRIIDAE

Orgyia antiqua (L.). Occasionally seen on the wing, and a few larvae on apple. English females were paired with Irish males, but the resulting moths produced nothing out of the ordinary.
Dasychira pudibunda (L.). Occasional at M.V.

LASIOCAMPIDAE

Poecilocampa populi (L.). A few at M.V., also larvae on apple.
Lasiocampa quercus (L.) var. *callunae* Palmer. Males assembled to a bred female.

DREPANIDAE

Cilix glaucata (Scop.). Occasional at M.V.

NOLIDAE

Roeselia confusalis (H.-S.). Two at M.V., 18.v.52 & 14.vi.54.

CYMBIDAE

Bena prasinana (L.) (*fagana* (F.)). A few at M.V.

ARCTIIDAE

Spilosoma lubricipeda (L.) (*menthastri*) (Esp.). Abundant at M.V.; most examples have pale buff fore-wings.
S. lutea (Hufn.). Abundant at M.V.
Cycnia mendica (Cl.) ssp. *rustica* (Hub.). A female was taken on the wing in the late afternoon of 1.vi.47, and ova were obtained. Resulting moths emerged in April and May, 1948, the males being white with a very pale buff tint. The bulk of both sexes was strongly

spotted. An F.1 pairing produced a short series of rather under-sized specimens in 1949. Two pairings were obtained also between 1948 females and typical English male *C. mendica* from Surrey. In one case all the larvae died before pupation, and in the other only two larvae reached the pupation stage. These produced a female, 28.iv.49, and a male, 30.iv.49. Both are very small and crippled, but the male is white and clearly of the *rustica* form. Two smoky buff males have been taken at M.V.

Phragmatobia fuliginosa (L.). Occasional at M.V.

Arctia caja (L.). Frequent at M.V. No variations of note so far.

Hypocrita jacobaeae (L.). Frequent at M.V.

LITHOSIIDAE

Nudaria mundana (L.). One only, at M.V., 21.vii.55.

Eilema lurideola (Zinck.). Frequent at M.V. I have not seen *E. complana* (L.) which Donavan (1936) considered a commoner insect in Ireland.

CARADRINIDAE

Apatele megacephala (Schiff.). Occasional at M.V.

A. psi (L.). Frequent at M.V.

A. rumicis (L.). Occasional at M.V.

Cryphia perla (Schiff.). Frequent at M.V. A fully grown larva found on 28.v.56 produced a moth with ochreous fore-wings.

Agrotis segetum (Schiff.). Very abundant and variable at M.V.

A. clavis (Hufn.). Occasional at M.V.

A. trux (Hb.) ssp. *lunigera* (Steph.). Males frequent at M.V. during July and August. Only one female taken. The comparative abundance of male *lunigera* about half a mile from the sea, in a residential area, confirms the fact that others have noted, namely, that this species is not always confined to coastal cliffs. Other recent Co. Dublin records are from the Hill of Howth, on the opposite side of Dublin Bay, where there are cliffs in plenty, and from Shankill, another inland locality, about three miles south of Glenageary (Beirne and Lisney, 1940).

A. exclamationis (L.). Swarms at M.V. and is very variable. One variety has a mark in the centre of the fore-wings, like a dark smear running into five points towards the outer margin.

A. ypsilon (Rott.). Occasional at M.V.

Euxoa nigricans (L.). Occasional at M.V.

E. tritici (L.). One only, at M.V., 26.vii.55.

Lycophotia porphyrea (Schiff.) (*varia* Vill.). Occasional at M.V.

Peridroma porphyrea Schiff. (*saucia* Hb.). Occasional at M.V.

Graphiphora augur (F.). Six at M.V., 18.vii.56.

Amathes glareosa (Esp.). Occasional at M.V.

A. baja (Schiff). Several at M.V. during second half of July, 1956.

A. c-nigrum (L.). Swarms at M.V.

A. ditrapezium (Bk.). A specimen of *A. ditrapezium* was taken at M.V. on the night of 18.vii.56. This night was a record so far as my M.V. trap is concerned. On the following morning I estimated over 2,000 macrolepidoptera in the trap. So far as I am aware this is the only Irish record of *ditrapezium* since Birchall's record of two specimens at sugar near Galway in July, 1857 (Birchall, 1866).

A. umbrosa (Hb.) (*sexstrigata* (Haw.)). Occasional at M.V.

A. xanthographa (Schiff.). Frequent at M.V.

Diarsia brunnea (Schiff.). Occasional at M.V.

D. festiva (Schiff.). Occasional at M.V.

D. rubi (Vieweg). Occasional at M.V.

Ochopleura plecta (L.). Occasional at M.V.

Triphaena comes (Hb.). Frequent at M.V. Variable fore-wings, including a few reddish tinged.

T. pronuba (L.). Very abundant, and variable, at M.V.

T. janthina (Schiff.). Frequent at M.V.

T. interjecta (Hb.). A few at M.V.

Lampra fimbriata (Schreb.). A few at M.V.

Polia nebulosa (Hufn.). Three at M.V. They are the usual pale Irish form, but are smaller than those taken by me in the west and south-west of Ireland. This appears to be a new county record.

Mamestra brassicae (L.). Unpleasantly common in the vegetable garden.

Diataraxia oleracea (L.). Occasional at M.V.

Ceramica pisi (L.). Occasional at M.V.

Hadena thalassina (Hufn.). Two at M.V., 23.v.53 & 29.v.54.

H. contigua (Schiff.). One only, at M.V., 14.vi.52. This appears to be a new county record.

H. glauca (Hb.) (*bombycina* (Hufn.)). One only, at M.V., 6.vi.50.

H. bicrucis (Hufn.). Fairly frequent at M.V. Larvae abundant on seedheads of garden Dianthus.

H. cucubali (Schiff.). Occasional at M.V.

H. lepida (Esp.) ssp. *capsophila* (Dup.). Abundant at M.V.

Tholera popularis (F.). A few at M.V.

Charaeas graminis (L.). Occasional at M.V.

Luperina testacea (Schiff.). Very abundant at M.V.; medium to dark forms.

Aporophyla nigra (Haw.). Frequent at M.V.

Eumichtis adusta (Esp.). A few at M.V.

E. lichenea (Hb.). Frequent at M.V.

Allophyes oxyacanthae (L.). Occasional at M.V.

Euplexia lucipara (L.). Two at M.V., 23.vii.55 & 26.vii.55.

Phlogophora meticulosa (L.). Frequent at M.V.

Phalaena typica (L.). One only, at M.V., 15.viii.55.

Apamea sordens (Hufn.). Frequent at M.V.

Xylophasia obscura (Haw.). Occasional at M.V., including ab. *remissa* (Hb.).

X. crenata (Hufn.). Frequent at M.V., including ab. *alopecurus* (Esp.).

X. lithoxylea (Schiff.). A few at M.V.

X. sublustris (Esp.). One only, at M.V., 1.vii.54.

X. monoglypha (Hufn.). Very abundant at M.V., varying from normal colouration to very dark brown.

Procus latrunculus (Schiff.). Fairly frequent at M.V. (An examination of the genitalia has disclosed no examples of *P. strigilis* (Cl.) nor *P. versicolor* (Bk.)).

P. fasciunculus (Haw.). A few at M.V.

P. furunculus (Schiff.). Frequent at M.V.

Miana literosa (Haw.). A few at M.V.

Celaena haworthii (Curt.). One only, at M.V., 24.viii.55. The nearest Cotton Grass is in the Dublin Mts., some nine miles away.

C. secalis (L.). Frequent at M.V.

Hydraecia oculea (L.). Males fairly frequent at M.V.

H. lucens Freyer. A few males at M.V.

H. crinanensis Burrows. A few males at M.V. (All examples of the above three species identified by examination of the genitalia.)

H. micacea (Esp.). Abundant at M.V. A larva found tunnelling in a potato, fed up entirely in the tuber, and produced a very dwarf specimen.

H. ophiogramma (Esp.). One only, at M.V., 20.vii.55.

Rhizedra lutosa (Hb.). A few females at M.V. I have been unable to find any Phragmites in the immediate neighbourhood.

Nonagria typhae (Thunb.). A few at M.V.

Leucania pallens (L.). A few at M.V.

L. impura (Hb.). A few at M.V.

L. comma (L.). A few at M.V.

L. lithargyria (Esp.). Fairly frequent at M.V.

L. conigera (Schiff.). A few at M.V.

Caradrina morpheus (Hufn.). Occasional at M.V. This appears to be a new county record.

C. alsines (Brahm). One only, at M.V., vii.47.

C. blanda (Schiff.). Fairly frequent at M.V.

C. clavipalpis (Scop.). Frequent at M.V.

Laphygma exigua (Hb.). Two worn immigrants at M.V. early in August, 1953. This appears to be a new county record.

Rusina umbratica (Goeze) (*tenebrosa* (Hb.)). A few dark specimens at M.V.

Amphipyra pyramidea (L.). A few at M.V.

A. tragopoginis (L.). Frequent at M.V.

Cerastis rubricosa (Schiff.). One only, at M.V., 6.v.56.

Orthosia gothica (L.). Abundant at M.V. The imago here seems to have a very long period of emergence, specimens being seen in March, April, May, and as late as 15.vi.51.

O. stabilis (Schiff.). Fairly frequent at M.V.

O. incerta (Hufn.). A few at M.V.

O. opima (Hb.) (*advena* (Schiff.)). One only, at M.V., 6.v.56. This appears to be a new county record.

O. gracilis (Schiff.). A few whitish specimens at M.V.

Cosmia trapezina (L.). Occasional at M.V.

Anchoscelis lunosa (Haw.). Very abundant at M.V.

Agrochola macilenta (Hb.). One only, at M.V., 12.xi.56.

A. circellaris (Hufn.). A few at M.V.

A. lychnidis (Schiff.). Fairly frequent at M.V.

Conistra ligula (Esp.). One only, at M.V. (Surprisingly, no example of *C. vaccinii* (L.) has been seen.)

Eupsilia transversa (Hufn.). A few at M.V., including one specimen only, with white marks in the reniform stigmata.

Lithophane socia (Hufn.). One at M.V., 26.v.53, and specimens occasionally found at rest in the garden.

Graptolitha ornitopus (Hufn.). One only, at M.V., 23.vi.55.

Xylocampa areola (Esp.). Fairly frequent at M.V.

Cucullia umbratica (L.). Fairly frequent at M.V.

Pyrrhia umbra (Hufn.). Two at M.V., 20.vi.53 & 18.vii.56.

PLUSIIDAE

Rivula sericalis (Scop.). Occasional at M.V.

Scoliopteryx libatrix (L.). Occasional at M.V.

Polychrisia moneta (F.). The first Irish record of this moth was dated 20.vii.39 (Beirne and Lisney, 1940). Nothing was heard of it again until 21.vi.52, when a specimen was attracted to a M.V. lamp hung inside a window overlooking my garden at Glenageary. A subsequent examination of Delphinium plants disclosed one cocoon in a garden at Clonskeagh in Dublin. Since 1952 the species has turned up regularly to M.V., and it is now a fairly frequent visitor to the trap, from about the middle of June to early August.

Plusia bractea (Schiff.). No examples of this insect were seen until 1956, when three were taken at M.V. between the 18th and 20th June.

P. festucae (L.). Fairly frequent at M.V.

P. v. aureum (Hb.) (*pulchrina* (Haw.)). Frequent at M.V. (I have not seen *P. iota* (L.) at Glenageary.)

P. gamma (L.). The numbers of this migratory species vary from year to year, as in most localities. The largest number seen was on 2.viii.51, when over 100 specimens were found in the M.V. trap.

Abrostola triplasia (L.). Fairly frequent at M.V.

A. tripartita (Hufn.). One only, at M.V., 14.vi.52.

Zanclognatha tarsipennalis (Treit.). A few at M.V.

Z. nemoralis (F.) (*grisealis* (Hb.)). A few at M.V.

Hypena proboscidalis (L.). Larvae on nettles, and moths bred.

Episema caeruleocephala (L.). One only, at M.V., 19.x.50.

GEOMETRIDAE

Geometra papilionaria (L.). Two at M.V., 2.viii.53 & 21.vii.55.
Hemithea strigata (Müll.) (*aestivaria* (Hb.)). Occasional at M.V.

STERRHIDAE

Sterrha subsericeata (Haw.). One only, at light, vi.47.
S. aversata (L.). Frequent at M.V.
S. biselata (Hufn.). A few at M.V.
S. dimidiata (Hufn.). Occasional at M.V.
Scopula marginipunctata (Goeze). Two at M.V., 18.viii.55 & 12.vi.56.

HYDRIOMENIDAE

Ortholitha mucronata (Scop.). One only, at M.V., 23.vii.56.
O. limitata (Scop.) (*chenopodiata* (Auctt.)). A few at M.V.
Larentia cervinalis (Scop.) (*clavaria* (Haw.)). One only, at M.V., 19.ix.55.
Anaitis plagiata (L.). A few at M.V.
Acasis viretata (Hb.). One only, at M.V., 24.viii.55.
Lobophora halterata (Hufn.). One only, at M.V., 15.vi.55. This appears to be a new county record.
Lygris prunata (L.). Two at M.V., 21.vii.55.
L. mellinata (F.). One only, at M.V., 3.vii.53. Previously, the only certain record of this insect in Ireland was from the garden of the late Mr. Dudley Westropp, at Clonskeagh in Dublin.
L. dotata (L.) (*pyraliata* (Schiff.)). Occasional at M.V.
Cidaria fulvata (Forst.). Two at M.V., 3.vii.53 & 21.vii.55.
Electrophaes corylata (Thunb.). Two at M.V., 22.vi.54 & 20.vi.55. This appears to be a new county record.
Dysstroma truncata (Hufn.). Frequent at M.V. About 90 per cent. of the insects at Glenageary are strongly melanic, including melanic forms of ab. *commanotata* Haw.
D. citrata (L.). One only, at M.V., 24.viii.55.
Chloroclysta miata (L.). Occasional at M.V.
Lyncometra ocellata (L.). A few at M.V.
Thera obeliscata (Hb.). Frequent at M.V.
T. firmata (Hb.). One only, at M.V., 14.x.56.
Xanthorhoë ferrugata (Cl.). Occasional at M.V.
X. spacidearia (Schiff.). Occasional at M.V.
X. designata (Hufn.). A few at M.V.
X. montanata (Schiff.). Occasional at M.V.
X. fluctuata (L.). Frequent at M.V.
Epirrhoe galiata (Schiff.). Occasional at M.V.
E. alternata (Müll.). Frequent at M.V.
Calostigia multistrigaria (Haw.). One only, at M.V., 6.v.56.

Euphyia unangulata (Haw.). One only at M.V., 20.vii.56. This appears to be a new county record.

E. bilineata (L.). Taken occasionally on the wing.

Earophila badiata (Schiff.). Two at M.V., 20.iv.55 & 29.v.56.

Coenotephria derivata (Schiff.). A few at M.V.

Pelurga comitata (L.). One only, at M.V., 22.vii.56.

Perizoma alchemillata (L.). One only at M.V., 2.viii.54.

P. flavofasciata (Thunb.). Occasional at M.V. This appears to be a new county record.

P. albulata (Schiff.). A few at M.V.

Oporinia dilutata (Schiff.). A few at M.V.

Eupithecia centaureata (Schiff.). Occasional at M.V.

E. pulchellata Steph. A few of the normal form taken at light.

E. indigata (Hb.). One only, at M.V., 29.v.56. Apparently a new county record.

E. venosata (F.). One only, at M.V., vii.55.

E. absinthiata (Cl.). Fairly frequent at M.V.

E. vulgata (Haw.). Frequent at M.V.

E. castigata (Hb.). One only, at M.V., viii.56.

E. icterata (Vill.). ssp. *subfulvata* Haw. A few at M.V.

E. isogrammaria H.-S. (*haworthiata* Stn.). One only, at M.V., 29.v.53. Apparently a new county record.

E. tenuiata (Hb.). One only, at M.V., vii.50. Apparently a new county record.

E. innotata (Hufn.). ssp. *fraxinata* Crewe. One only, at M.V., 3.vii.53. Apparently a new county record.

E. nanata (Hb.). Occasional at M.V.

E. dodoneata Guen. One only at M.V., 9.v.50.

E. exiguata (Hb.). Fairly frequent at M.V.

Gymnoscalis pumilata (Hb.). Frequent at M.V.

Chloroclystis rectangulata (L.). Fairly frequent at M.V., including melanic forms.

Nycterosea obstipata (F.). A male of this migrant species was taken at light on 11.vi.47, and eight more between 17.ix.47 & 19.ix.47.

BREPHIDAE

Alsophila aescularia (Schiff.). One only, at M.V., 24.iii.50.

SELIDOSEMIDAE

Abraxas grossulariata (L.). A few at M.V.

Ellopia prosapiaria (L.) (*fasciaria* (Schiff.)). A few at M.V.

Ennomos quercinaria (Hufn.). Males frequent at M.V.

Deuterononos alniaria (L.). Two at M.V., 20.ix.51 & 19.ix.55.

Selenia bilunaria (Esp.). Occasional at M.V., including var. *juliaria* Haw.; ab. *eblanaria* Baynes, originated at Glenageary (Baynes, 1952).

Gonodontis bidentata (Cl.). Frequent at M.V.

Colotois pennaria (L.). Fairly frequent at M.V.

Crocallis elinguaria (L.). Fairly frequent at M.V.
Ourapteryx sambucaria (L.). Occasional at M.V.
Opisthograptis luteolata (L.). Frequent at M.V.
Lithina chlorosata (Scop.). One only, at M.V., 17.vi.56.
Semiothisa liturata (Cl.). Two at M.V., 21.vii.55 & 11.viii.56.
Itama wauaria (L.). One only, at light, vii.47.
Erannis progemmaria (Hb.) (*marginaria* (Bk.)) One only, at M.V., 14.iii.55.
E. defoliaria (Cl.). Two at M.V., 7.xii.54 & 3.xii.56.
Biston betularia (L.). Males usually frequent at M.V. Very few females so taken. One male ab. *carbonaria* Jordan found at rest outside the M.V. trap on the morning of 27.v.52. Ab. *carbonaria* appears to be very rare in Ireland. There is a previous record for Co. Dublin, two of the moths having been bred from wild larvae at Shankill. (Lisney, 1940).
Cleora rhomboidaria (Schiff.). Occasional at M.V.
Gnophos obscurata (Schiff.). The typical grey form occasional at M.V.
Bupalus piniarius (L.). One female 27.vi.52 and one male 11.vii.54; both at M.V.

ZYGAENIDAE

Zygaena filipendulae (L.). Seen occasionally by day.

HEPIALIDAE

Hepialus humuli (L.). Occasional at M.V.
H. fusconebulosa (Deg.). Occasional at M.V., including ab. *gallicus* (Led.).

GALLERIIDAE

Aphomia sociella (L.). A few at M.V.

PYRALIDAE

Aglossa pinguinalis (L.). One only, vii.49.

PYRAUSTIDAE

Nymphula nymphaeata (L.). Occasional at M.V.
Margaronia unionalis (Hb.). One specimen of this rare migrant at M.V., 7.ix.55. This appears to be a new county record.
Mesographa forficalis (L.). Fairly frequent at M.V.
Notarcha (*Sylepta*) *ruralis* (Scop.). A few at M.V., and larvae on nettles.
Nomophila noctuella (Schiff.). Occasional at M.V.
Eurrhypara hortulata (L.). A few at M.V.
Pyrausta olivalis (Schiff.). Occasional at M.V.
Phlyctaenia fuscalis (Schiff.). One only, at M.V. 29.v.53.

P. lutealis (Hb.). A few at M.V.

P. martialis (Guen.) (*ferrugalis* (Hb.)). A few at M.V., ix.49.

ALUCITIDAE

Platyptilia acanthodactyla (Hb.). Two at light, x.47 and ix.55. Apparently a new county record.

P. gonodactyla (Schiff.). A few at M.V.

Stenoptilia saxifragae Fletcher. In the autumn of 1946 a small area in the garden was planted with Mossy Saxifrage with a view to attracting *S. saxifragae*, the well known Dublin Plume Moth. The first moths were seen in 1948, and the species is now abundant in the garden.

S. bipunctidactyla (Scop.). One only, at light, vi.47.

Oidaematophorus lienigianus (Zell.) (*monodactylus* (Haw.)). Fairly abundant in autumn. Frequents Ivy bloom.

ORNEODIDAE

Orneodes hexadactyla (L.). One only, at M.V., 31.v.56.

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2 Arkendale Road,
Glenageary,
Co. Dublin, Eire.

BOOK REVIEW

Annotated Catalogue of African Grasshoppers, compiled by H. B. Johnston, with a preface by B. P. Uvarov. Published for the Anti-Locust Research Centre by the Cambridge University Press. xxii + 833 pp. Crown 4to. Cloth. 1956. Price £5 5s.

This handsome volume, representing the fruition of several years' work by a compiler well versed in Acridological literature and eminently familiar with his subject in the field, goes a very long way towards satisfying a much-felt want—the revision of Vol. III of Kirby's *A Synonymic Catalogue of the Orthoptera,* published nearly half a century ago. Although it is not, as was the older work, a world list, a large proportion of known Acridoidea are African and the new work incorporates many references of a kind omitted by the earlier publication. It is, in fact, the declared object of this new catalogue to present a complete and readily usable index to *all* information (not only systematic) relating to African short-horned grasshoppers from

1758 until the end of 1953 (five papers of 1954 are also included). Since the literature on the five African species of locust is so vast, however, it has not been possible to include references to these other than those of a systematic or faunistic nature. On account of the enormous and largely sterile task of unearthing and checking such references, annual reports of Agricultural departments and papers not dealing primarily with Orthopteroids are not greatly in evidence, either, although the comprehensive bibliography contains almost 1,000 titles. The major groupings and arrangement of genera are those in use in 1953—certain advances in this field have recently been made—but species are arranged alphabetically; subspecies and distinctive infra-subspecific forms are also listed. Species from Madagascar and other islands in the Indian and Atlantic oceans are also given. References under each species are listed chronologically and annotations concerning the various aspects with which they deal follow. The latter cross-refer to the list of references and to the bibliography. Some species occurring in Africa and also in Asia and/or Europe have required special treatment and only a selection of the more important non-African references is given.

Mr. Johnston is to be congratulated on a very fine, painstaking piece of work, especially as it is clear that every paper cited has been personally checked. Inevitable errors and misprints will creep into a work of this size, and the compiler would welcome these—together with any omissions—being brought to his notice, since it is intended to produce supplements to the work (a very encouraging sign). A few such errors have, in fact, already been noticed, but they are most trivial when the magnitude of Mr. Johnston's task is considered.

The book is nicely bound, the paper of good quality and the type clear. The format is such as to ensure rapid usage, although in consequence it might be criticized as being rather wasteful of space (most pages have wide, blank areas on the right-hand margin, and many names are repeated a large number of times in succession without variation). The price is probably a nominal one, since much of the cost of compilation has undoubtedly been borne by the sponsors, but even so, it puts the purchase of this volume outside the reach of most individuals (indeed, the book is not intended for the individual other than the specialist) and of many smaller laboratories who might find it extremely helpful.

The increasing threat of grasshoppers to expanding African agriculture is the theme which launches the publication of this valuable work; but it requires no justification and is long overdue. Its usefulness to Agricultural and Entomological laboratories throughout Africa and Madagascar is unquestionable and there are those in Asia and Europe who will find it of great service. Specialists and museums containing African and Malagasy material will be ill-equipped indeed if they do not possess it.

D. K. McE. K.

PYRAUSTA PERLUCIDALIS (HÜBNER), A PYRALID NEW TO THE BRITISH ISLES

By R. M. MERE AND J. D. BRADLEY

PART I. NARRATIVE

By ROBIN M. MERE

Although in every year since the war on average two new species of macrolepidoptera have been recorded as resident in or visiting this country, and a similar number of new microlepidoptera have been recorded, it is still something of an event to be able to draw attention to a Pyralid new to the British Isles, and probably indigenous. New Pyralids and Plume Moths are comparatively rarely found. *Alucita icterodactylus* Mann was discovered in the Burren, Co. Clare, in 1952; there was a small migration of *Hymenia recurvalis* Fabr., in 1951, one *Chilo cicatricellus* Hb. has been taken, one *Ancylolomia tentaculella* Hb., in 1952, and in 1956 *Heterographis oblitella* Zell., of which a few were taken in earlier years, was found to be breeding and not a rare migrant. It was in fact as long ago as June 1951 that I caught two male examples of *Pyrausta perlucidalis* (Hb.), and the circumstances are as follows:

Mr. Eric Classey took me with him on a visit to Wood Walton Fen in late June, 1951, hoping to find a late *Hydrilla palustris* (Hb.) (The Marsh Moth). In this we failed, but for me it was a highly successful visit. Being the first occasion on which I had collected in a fen or marsh, there were a number of species, many common, that were new to me. When it is realized that I saw for the first time such locally abundant insects as *Chilo phragmitellus* (Hb.), *Clepsis costana* (Fabr.), *Chilodes maritima* (Tausch.) (The Silky Wainscot), *Zanclognatha cribrumalis* (Hb.) (The Dotted Fanfoot), *Apamea unanimis* (Hb.) (The Small Clouded Brindle), and *Earias clorana* (L.) (The Cream-bordered Green Pea), it will be realized that dusking, the M.V. lamp and sugar all provided much that I needed.

Both specimens of *perlucidalis* were taken flying at dusk on the 24th June. They were not identified at the time. Later, aided by the books available, they were assumed to be a form of *P. fuscalis* Schiff., a species which was not then represented in my collection.

In October, 1956, Mr. Teddy Pelham-Clinton was looking through my collection and pointed out that these two insects were not *fuscalis*. I had in fact taken for the first time a few specimens of *fuscalis* in 1956, which were waiting to be placed in the cabinet. Thus I was easily able to verify that the two 1951 insects were certainly not *fuscalis*. What they were I was unable to determine; indeed, they did not seem to be illustrated or referred to in Beirne (1952).

Accordingly they were submitted to Mr. John Bradley, of the British Museum (Natural History), and he and Mr. Edward Martin identified them as *P. perlucidalis*.

Lhomme (1935), page 136, states that *perlucidalis* is found very locally in Northern France and mentions one Belgian locality. He adds that the moth is on the wing in May and June, that the larva is stated to feed on *Cirsium oleraceum* Scop., a thistle, under the leaves along a vein without a silken thread, in June to August, and apparently it pupates in September or hibernates and pupates to emerge the following June. Spuler (1908) states that the species is found in France, Austria and Dalmatia.

Clapham (1952) states that *C. oleraceum* is an introduced plant established in a few localities in England and Scotland, and that it occurs in marshes, fens, flushes, stream-sides and wet woods in Central Europe from Central France, North Italy and North Balkans northwards to 61 deg. 15 min. N. in Norway and to Central Russia; also in Siberia.

Dr. Duffey, of the Nature Conservancy, Norwich, tells me that *C. oleraceum* has not been recorded from Wood Walton Fen, though *C. arvense, palustre, vulgare* and *eriophorum* have been recorded there. Perhaps one of these is the foodplant here.

It seems to me almost certain that the species is indigenous, in spite of it not having been previously recorded. Of course the number of entomologists interested in the Pyralidae is small, and was smaller still before the publication of Beirne's excellent book (1952). Also *P. perlucidalis* might easily be passed over for a worn example of some other insect. Moreover, if it is a late June insect with us, it is on the wing between times, that is to say, too late to be taken by entomologists seeking *H. palustris,* and too early for those seeking *Arenostola extrema* (Hb.) (The Concolorous) or wishing to see the Continental form of the Large Copper on the wing: this is maintained at Wood Walton Fen, and is a most beautiful butterfly.

It may well prove worth while for entomologists to make an examination of their series of *P. fuscalis* in the hope of finding *P. perlucidalis* among them.

PART II. DESCRIPTION

By JOHN D. BRADLEY
British Museum (Natural History)

The following description is based on the two examples collected by Mr. Robin Mere at Wood Walton Fen, Huntingdonshire, and on several Continental examples of this species in the British Museum (Natural History). One of the specimens from Wood Walton has been generously presented to the British Museum by Mr. Mere, and the other is in his collection.

Pyrausta perlucidalis (Hübner)

Pyralus perlucidalis Hübner, 1800-1809, Samml. Europ. Schmett., **6**: pl 22, Fig. 143.

PLATE IV

♂ ♀—21-23 mm. Forewings and hindwings with ground colour whitish and sometimes with a very weak purplish iridescence; markings pale ochreous irrorate with fuscous, first and second transverse lines poorly-defined, third or transverse posterior line serrate, curved; a broad subterminal fascia, the outer or distal edge of which is diffuse and the inner or anterior edge moderately well-defined and serrate; discal marking reniform, moderately solid, darker fuscous and considerably more conspicuous than the other markings; terminal neural spots dark fuscous. Hindwing maculation resembling that of forewing but lacking a discal marking. Labial palpus greyish-ochreous excepting undersides of first and second segments, which are white. Head whitish-ochreous. Thorax ochreous anteriorly, whitish posteriorly; tegula ochreous basally, whitish apically and tipped with long white scales. Abdomen fuscous, first segment wholly overlaid with white above, posterior segments strongly overlaid with a mixture of ochreous and whitish scales above; underside strongly overlaid with white scales. Legs white interiorly; foreleg greyish-ochreous exteriorly; middle and hindlegs greyish pale ochreous exteriorly.

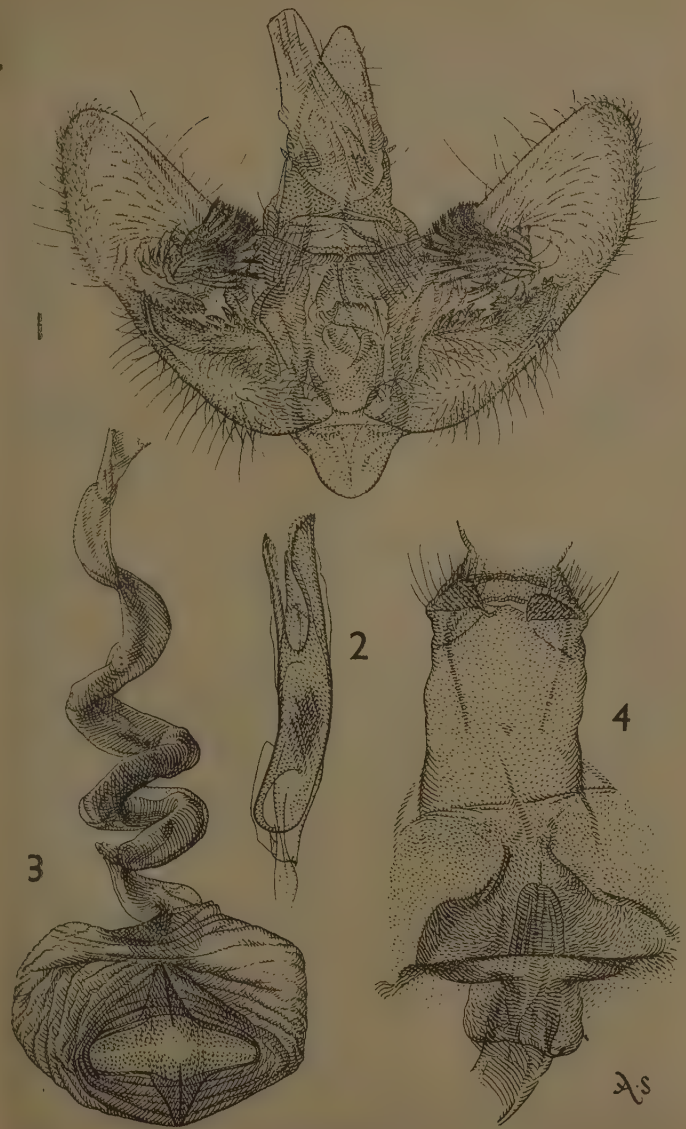
Male genitalia (Figs. 1 and 2). Sacculus with inward edge very strongly dentate. Pad crenate, the digitate scales have large heads with 5-11 fingers. Aedoeagus cleft, both arms having strongly serrate edges and being broadly rounded apically, with one arm much narrower and slightly shorter than the other; a dense internal sheaf of needle-like cornuti which appear to be deciduous.

Female genitalia (Figs. 3 and 4). Ostium bursae very broad, ventral lip (lamella antevaginalis) slightly arched caudad. Ductus bursae spiralled and with surface partly sclerotized towards bursa. Bursa copulatrix subspherical, membranous, a sclerotized area at inception of ductus bursae; signum stellate, with four rays, one pair of opposing rays acutely pointed, the other pair obtuse; surface scobinate.

The comparatively solid and conspicuous reniform marking of the forewing, and the irrorate appearance of the other wing markings, distinguish *perlucidalis* from other British species of *Pyrausta* (sens. lat.). The species is a close relative of *coronata* Hufn. (*sambucalis* Schiff.), and may be placed next to it in the collection. The genitalia structure is very similar in both sexes and indicates a close generic relationship between these two species, but as there is a quite considerable difference in the wing maculation they are unlikely to be confused.

P. perlucidalis is on the wing at the same time as the common elder-feeding species *fuscalis* Schiff., and the two may occur together. Although not so closely related, *fuscalis* in some respects resembles

Pyrausta perlucidalis (Hübner).



Figs. 1-4. Genitalia of *Pyrausta perlucidalis* (Hübn.). (1) Male, ventral aspect. (2) Aedoeagus, lateral aspect. (3) Female, showing ductus bursae, bursa copulatrix and signum. (4) Ostium, ventral aspect.

perlucidalis more closely in appearance than does *coronata*, and as there is some variation in *fuscalis* in the fen districts the coloration of paler or faded examples of this species may be similar to that of *perlucidalis*. But the characteristic conspicuous discal marking in the forewing of *perlucidalis* should enable it to be distinguished from *fuscalis* without difficulty. The two examples of *perlucidalis* from Wood Walton Fen and the several Continental examples which have been examined are constant in coloration and markings, and the reniform discal marking of the forewing is more pronounced than in any *fuscalis* examined.

The illustrations of the moth and male and female genitalia of *Pyrausta perlucidalis* are reproduced from drawings made by Mr. Arthur Smith.

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BOOK REVIEW

The Microscope Made Easy. A. Laurence Wells. (Frederick Warne & Co. Ltd., 1957. pp. 256. 15 plates (8 col.). New and revised edn. 12s. 6d.)

Natural history, like the other sciences, tends to become increasingly specialized, and it is very desirable that the young student should early acquire a working knowledge of the microscope. And thus such a book as this, which combines a knowledge of the subject with a clear style, should find a ready public. Even the armchair naturalist, who may have neither the time nor the wish to use a microscope, will find much to attract him in this interesting volume. For not only does it explain the working basis of simple microscopic investigation, but it is also helpful on collecting, preparing and preserving specimens.

Of course, insects are but one branch of a book which deals with natural history as a whole, but that is more or less inevitable, as the need of microscopic detail is essential in many directions, and the main purpose of a student should be so to master the technique that he feels at home with the microscope. And this calls for a competent guide and close application. Here is the guide, let his be the application.

The fifteen full-page plates, eight of which are in colour, and the numerous explanatory line-drawings in the text are a pleasing and useful feature.

R.C.

A DESCRIPTIVE NOTE ON *XANTHORHOË BIRIVIATA* BKH. (LEP: GEOMETRIDAE)

By G. HAGGETT

In May 1956 Mr. Minnion kindly sent me eggs of this species so that I might describe and figure the early stages, but the larvae died at hatching; Mr. Classey then most generously sent a new supply with live females taken by him on 2nd June. Females lived on sugar water for a fortnight after I received them and eggs were laid up to 16th June.

They were split into two batches, one placed outdoors on enclosed growing plants of *Impatiens fulva* and the other kept in glass-topped tins on cut food indoors at ordinary room temperatures. The outside larvae were badly hit by the fierce gales and rainstorms of mid June, but those kept indoors did very well. The average time spent in the larval stage of the outdoors larvae was 23 days, those indoors 18 days, and of the latter five larvae reached full growth in 13 days; the longest took 20 days.

One male moth emerged on 20th July and a female on 22nd, both being of the darker summer brood. All 57 other pupae coloured up and showed full wing colours by 4th August, but no more emerged either then or during the rest of that year.

The two moths were fed on sugar water and kept in an airy jar. No pairing was seen, but eggs were laid from 31st July until 17th August and all told reached the remarkable total of 405, of which 77 were infertile and 63 died at hatching. They were laid mostly on the undersides of *I. fulva* leaves, with as many as 100 on one small leaf. The male died after 23 days, the female after 27 days.

Eggs hatched in large numbers from 4th August and pupation began from 22nd August just as the last laid eggs were hatching. All had pupated by 6th September, following very closely the time-table of the first brood: they had all been kept indoors in airtight tins on cut foodplant, and to my mother goes the considerable credit of feeding and managing this vast brood on such a difficult foodplant.

One female of the spring brood colouring emerged on 16th September, the only moth to emerge from this second brood. All other pupae coloured up fully by mid September.

Of the large second brood only two larvae were green at the last instar. Amongst the rest there were a few only that lacked the heavy dorsal pattern, the greater number being thus of the dark brown well marked form. Such peculiar distribution of variation amongst the progeny of one pairing may be in part due to confinement and treatment, and a different assortment may occur in a natural environment. There were no green larvae at full growth in the first brood.

The egg stage of each brood lasted about seven days. Pupation was very quick and was completed within a day of the larva lying up.

Second brood larvae were tried on the cultivated red flowering forms of Balsam when first hatched and again when larger, but it was refused at each occasion.

Description of the larva

The largest larvae at full growth measured 26 mm. long. They are of the characteristic *Xanthorhoë* shape and pattern; the head is small and just less in width than the first segment; the second and third thoracic segments are slightly swollen and puckered laterally; the abdominal segments are of regular cylindrical shape, longer than broad, and gently constricted at the intersegmental divisions, the segments increasing in girth but slightly from the thoracic.

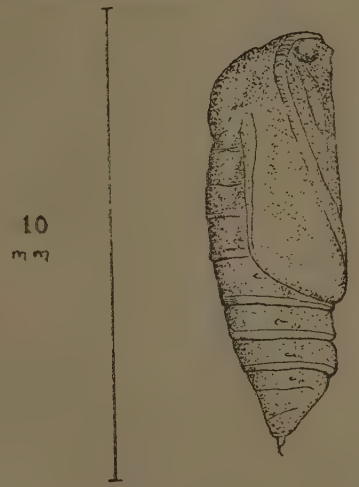
The general pattern is based on a fine dorsal line that is extended into a small black dash at the beginning of each of the 2-6 abdominal rings and followed by a longer streak at the centre of each of those rings. This system is outlined by a fine pale line and is then bound to the spiracular line by a broad band of darker shading broken only by a fine pale subdorsal line with immediately below it a less distinct pale wavy irroration. There is sharp contrast between the lateral dark shading above the spiracular line and the much paler colouring below which is relieved only by the faintest mottling of ochreous or orange. Beneath, the larva has a broad pale central band narrowly divided by a fine dark line, and a double set of loosely drawn bands to each side which meet at the intersegmental areas to form a series of open chain, each link marked by a dark dot. The division between the darker dorsal and paler ventral colouring is sharpened by the strong development of a freckled blackish spiracular band on the thoracic segments, and again on the last abdominal where the stripe runs the length of the anal claspers and prolegs; at both ends of the stripe there is below it a dusting of white. True legs pale brown, prolegs of sixth abdominal segment blackish in marked contrast to the pale ventral shading. Head small, rounded, flattened in front with well developed lobes much freckled with black, the dots forming a darker streak to each side that joins with the spiracular band of the prothorax. Thoracic plate of the usual Geometrid type, weakly expressed and ill defined; anal flap ochreous and well studded with black hairs. The body and head are set with sparse but sturdy bristles, those on the body placed on a tiny white tubercle.

During its early life the larva is a plain glassy bluish-green, but at the penultimate larval moult (i.e. the second before the pupal change) there is a great variety of pattern and colour. This mostly vanished by the next moult amongst the large numbers of larvae we had in captivity, and in the last instar the majority were of the dark brown form described below. At this variable phase there is every intermediate shade in colouration from a soft pale yellow-

green through olive and blue-green to grey-brown and red-brown; each colour form may bear a weak and simple pattern or it may be heavily suffused by dark mottling, and one of the prettiest forms is that which combines the palest green with the heaviest black dorsal pattern. The green forms are decorated with lemon-yellow at the intersegmental folds and ventrally, the brown and greyish forms with orange and pink.

At the last instar variation is much more limited. In its simplest guise the dorsal dots and dashes stand starkly and unrelieved on a plain ground colour; at the extreme development of the dark brown forms the posterior dorsal streak becomes extended by dark suffusion to occupy so much of the dorsum that only the set of anterior dots stand on a pale patch.

The commonest form of the last instar larva has a dusky brown



Pupa of *Xanthorhoë biriviata* Bkh.

suffusion above the spiracular line, with a darker blotch at the centre of the dorsum of each abdominal segment. The black truncated dash at the beginning of each abdominal segment is isolated in an isosceles triangle of pale fawn, with the long axis directed on to the posterior part of the preceding segment. The black streaks of the dorsal line on the latter abdominal rings are not conspicuous, but the pale lateral lines are very distinct.

The form with similar dusky markings and pattern to the common brown type, but with a bright green ground colour, occurred with us only in the second brood, and only in two larvae out of 281.

Another distinctive but infrequent variety is the unicolorous pale brown form spectacularly ornamented by sharply etched black dashes and blotches of the dorsal pattern associated with the black freckling in the spiracular region of the thoracic and latter abdominal rings and dark clasper streaking which persist in all forms.

Variation of the fully grown larva of *X. biriviata* can be likened to that of other British *Xanthorhoë* species, and in particular to that of *X. fluctuata*.

Description of the pupa

Measures to 8 mm. long by 3 mm. at its broadest, which is across the fourth abdominal ring. In shape it is rather dumpy and more irregular in profile than many geometrid pupae. From the dorsal aspect the pupa has a rounded head and well shouldered wing cases that sweep outwards to reach the maximum width at the fourth abdominal ring. The fall-off in abdominal rings is quick but regular from the sixth. In profile the head is held slightly forward and the wing-cases are considerably raised from the abdomen. The fifth and sixth abdominal rings are quite free.

Spiracles narrowly oval, very weakly marked on the abdomen. Shell of head, wings and appendages very smooth, light red-brown, shell of first four abdominal rings and anterior part of others minutely and sparsely pitted, all darker red-brown.

Cremaster placed centrally, consists of a pair of sturdy, hooked spines supported by a weaker and much shorter pair.

BOOK REVIEW

The Water Relations of Terrestrial Arthropods, by E. B. Edney, D.Sc. Cambridge Monographs in Experimental Biology. No. 5. 108 pp. Cambridge University Press, 1957. Price 15s. net.

This subject includes interesting matter for zoologists, but there is a large amount of higher physiology and chemistry for those who can appreciate these subjects at the level to which they have been brought in the last few decades. I would describe the book as more suited to these highly-trained biologists and I looked at my copies of the late Professor Buxton's papers on much the same subjects and felt that the explanations in the 1920's and 1930's were written for a larger clientele, which perhaps shows how much water has flowed under the bridges in the last 30 years.

The author starts with a description of the 'saturation-deficit law', physical factors as they affect development and longevity, and in the following chapters reviews all the work that has been done on loss of water in the arthropods and its replacement.

There is a long series of 'References' at the end of the book, the title used in this series for what used to be described as bibliography.

FRANK BALFOUR-BROWNE.

THE BRITISH CARABIDAE (COLEOPTERA), PART II:

THE COUNTY DISTRIBUTION OF THE SPECIES

By B. P. Moore, D.Phil., F.R.E.S.

Carabid beetles, being predominantly terrestrial in habits, are particularly well suited to zoogeographical studies, and the British fauna is of as much interest as any from this point of view. However, although there exists a wealth of recorded information concerning the distribution of our Carabidae, it lies scattered widely through the literature and is not at all readily available, *in toto*, to students of the group. For several years I have been engaged in the necessary survey—a task which has involved page-by-page examination of many hundreds of publications and is at last complete. The resulting chart will, I hope, serve not only to show what has been recorded, but also to emphasize what has not!—and thus provide a stimulus to renewed interest in the distribution patterns of the species.

In preparing the chart I have endeavoured to take account of all records and local lists published this century, but inevitably some will have been overlooked. I have included also a number of unpublished but well-authenticated records, supplied by friends and correspondents, as well as those regarded as current by Fowler (1887), whose great work, although not strictly within my time-limits, forms the foundation of modern British coleopterology. Since many of the basic county lists (Victoria County History series) were compiled in the early 1900's, some of the records they contain relate to captures made before the beginning of the present century; these I have edited to some extent. In general, I have discarded old records repeated from Dawson (1854) or earlier writers, with the exception of a few important cases (indicated by the symbol 'o'), where available modern records, taken by themselves, would give a false impression of the natural range of the species concerned. Editing has also proved necessary in the case of species whose taxonomy and/or nomenclature has been subject to much confusion in the past.

The layout of the chart is largely self-explanatory, but the divisions employed for Scotland need to be defined as follows: I = West Lowlands (Dumfries, Kirkcudbright, Wigtown, Ayr, Renfrew and Lanark); II = East Lowlands (Peebles, Selkirk, Roxburgh, Berwick and the Lothians); III = East Highlands (Fife and Kinross, Stirling, Perth and Clackmannan, Angus, Kincardine, Aberdeen, Banff, Moray, East Inverness and Nairn); IV = West Highlands (West Inverness, Argyll, Dumbarton, Clyde Isles, Cantire and Ebudes); V = North Highlands (Ross, Sutherland and Caithness); VI = Northern Isles (Outer Hebrides, Orkneys and Shetlands). The county of London

is retained as a separate division largely on account of its ecological significance. The specific nomenclature follows that proposed in Part I of this series (Moore, 1957).

I am well aware that I shall be criticized in some quarters for having followed a county, rather than a vice-county system. However, I do not consider the refinement to be gained from a vice-county distribution (which is still far from equitable in its territorial division) would justify the extra labour involved in the necessary reclassification of many thousands of county records. Moreover, many of the latter would have to be discarded, where specific localities are not given.

Throughout the course of this study I have enjoyed the help and encouragement of a considerable number of entomologists. In particular, I wish to thank Dr. A. M. Massee for the loan of his extensive library of local lists for an extended period, and Rev. C. E. Tottenham and Mr. A. A. Allen for providing many hundreds of valuable records from their own collecting. My thanks are also due to the following gentlemen for detailed information concerning the faunas of specific areas: G. H. Ashe (Devon), R. S. George (Gloucester), O. Gilbert (Anglesey), C. Matheson (Wales), J. M. Nelson (Isle of Man), E. C. Riggall (Lincoln), and W. A. Wilson (Somerset), and to all those friends and correspondents who have provided specimens, records or literature, or have helped in other ways.

In conclusion, I should like to take the opportunity to express my gratitude to the members of the entomological and library staff at the British Museum (Natural History), where my many requests have been met with the greatest courtesy, and to the Editors of this magazine for their forbearance during the difficult period of going to press.

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Montrose, Stoneyfields,
Farnham, Surrey.
April, 1957.

	NAME OF SPECIES	CORNWALL S.I.	DEVON	SOMERSET	DORSET	WILTSHIRE	HAMPSHIRE I.W.	BERKSHIRE	SUSSEX	SURREY	KENT	ESSEX	MIDDLESEX	LONDON	HERTFORD	BUCKINGHAM	OXFORD	GLOUCESTER	MONMOUTH	HEREFORD	WORCESTER	WARWICK	NORTHAMPTON	BEDFORD	HUNTINGDON	CAMBRIDGE	SUFFOLK	NORFOLK	LINCOLN	RUTLAND	LEICESTER	NOTTINGHAM	DERBY	STAFFORD	SHROPSHIRE	CHESHIRE	LANCASHIRE	YORKSHIRE	WESTMORLAND	DURHAM	CUMBERLAND	NORTHUMBERLAND
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
1	Cicindela sylvatica ...		+		+		+	+		+																+			0												
2	C. hybrida																																			+	+				+	
3	C. maritima	+	+	+	+		+				+																+	+	0							+						
4	C. campestris	+	+	+	+		+	+	+	+	+	+	+		+	+	+	+		+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
5	C. germanica		+		+		+																																			
6	Calosoma inquisitor ...		+				+	+	+	+	+	+			+		+	+								+	+	+			+			0	0		+				+	
7	Carabus monilis ...	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+		+		+	+	+	+	+	+	+	+	+		+	+	+		+	+		+	?	
8	C. arvensis	+	+	+	+		+	+	+	+		+						+			+						+	+			+			+		+	+	+	+	+	
9	C. granulatus	+	+	+	+		+	+	+	+		+			+	+	+	+		+		+	+	+	+	+	+	+	+		+	+	+		+	+	+		+	+	
10	C. clathratus																										0	0														
11	C. nemoralis	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+		+	+		+	+	+	+	+	+	+	+	+	+	+	+		+	+	+		+	+	
12	C. glabratus																																+				+	+	+	+	+	
13	C. problematicus ...	+	+	+	+	+	+	+	+	+	+	+			+	+	+	+		+			+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
14	C. nitens			+	+		+																								0			+			+	+	+	+	+	
15	C. intricatus	+	+																																							
16	C. violaceus	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
17	Cychrus caraboides ...	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+		+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	
18	Leistus spinibarbis ...	+	+	+	+		+	+	+	+	+	+	+		+	+	+	+		+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
19	L. montanus																																							+	
20	L. rufomarginatus ...										+																+															
21	L. fulvibarbis	+	+	+	+			+	+	+	+	+			+	+	+	+		+	+	+		+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	
22	L. rufescens	+	?		+		+	+	+	+	+	+			+		+	+		+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+		+	+	
23	L. ferrugineus ...	+	+	+	+	+	+	+	+	+	+	+			+	+	+	+		+	+	+		+	+	+	+	+	+	+	+	+	+		+	+	+		+		
24	Eurynebria complanata	+	+	+																																						
25	Nebria brevicollis ...	+	+	+	+	+	+	+	+	+	+	+			+	+	+	+	+	+	+				+	+	+	+					+	+	+	+	+			+	
26	N. salina	+	+		+	+	+	+	+	+	+						+	+		+	+			+		+			+			+			+	+	+			+	
27	N. rufescens																															?	+	+		+	+	+	+	+	+	
28	N. nivalis																																									
29	N. livida																										+	+						+				+				
30	Pelophila borealis ...		+																														+									
31	Notiophilus aestuans						+																																			
32	N. aquaticus	+	+	+	+		+	+	+	+	+	+			+		+	+		+		+		+	+	+	+	+	+		+	+	+		+	+	+		+	+	
33	N. germinyi		+		+		+	+	+	+	+							+									+	+							+		+				
34	N. palustris	+	+	+	+		+	+	+	+	+	+			+	+	+	+		+	+	+		+	+	+	+	+	+		+	+	+		+	+	+	+	+	+	
35	N. substriatus	+	+	+	+		+	+	+	+	+	+		+	+		+	+	+	+	+	+		+	+	+	+	+			+	+		+	+	+	+	+	+	+	
36	N. rufipes		+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+			+	+	+	+	+	+			+							+		
37	N. biguttatus	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
38	N. quadripunctatus ...	+	+		+		+	+	+	+	+	+											+				+	+				+			+		+			+	
39	Blethisa multipunctata	+	+	+	+				+	+		+	+											+	+	+	+	+	+	0		+	+				+	+			+	
40	Elaphrus lapponicus ...																																					+			0	
41	E. uliginosus	+	+	+	+		+			+							+	+			+		+		+	+	+					+	+								
42	E. cupreus	+	+	+	+	+	+	+	+	+	+	+			–	–	+	+		+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	
43	E. riparius	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+		+	+	+	+	+	+			+	+	+	+	+	+	+	+	+	
44	Loricera pilicornis ...	+	+	+	+		+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41

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Farnham, Surrey.
April, 1957.

	NAME OF SPECIES	CORNWALL S.I.	DEVON	SOMERSET	DORSET	WILTSHIRE	HAMPSHIRE I.W.	BERKSHIRE	SUSSEX	SURREY	KENT	ESSEX	MIDDLESEX	LONDON	HERTFORD	BUCKINGHAM	OXFORD	GLOUCESTER	MONMOUTH	HEREFORD	WORCESTER	WARWICK	NORTHAMPTON	BEDFORD	HUNTINGDON	CAMBRIDGE	SUFFOLK	NORFOLK	LINCOLN	RUTLAND	LEICESTER	NOTTINGHAM	DERBY	STAFFORD	SHROPSHIRE	CHESHIRE	LANCASHIRE	YORKSHIRE	WESTMORLAND	DURHAM	CUMBERLAND	NORTHUMBERLAND
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
1	Cicindela sylvatica ...		+		+		+	+		+																+															
2	C. hybrida																									+			0												
3	C. maritima	+	+	+	+		+				+																									+	+				+	
4	C. campestris	+	+	+	+		+	+	+	+	+	+	+		+	+	+	+		+		+	+	+	+	+	+	+	0						+						
5	C. germanica		+		+		+																								+	+	+	+	+	+	+	+	+	+	+
6	Calosoma inquisitor ...		+				+	+	+	+	+	+			+		+	+																							
7	Carabus monilis ...	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+		+		+	+	+	+	+	+	+		+			0	0		+				+	
8	C. arvensis	+	+	+	+		+	+	+	+		+			+	+	+	+				+	+	+	+	+	+	+	+		+	+	+			+	+		+	?	
9	C. granulatus	+	+	+	+		+	+	+	+		+						+			+						+	+		+		+				+	+	+	+	+	
10	C. clathratus														+	+	+	+				+	+	+	+	+	+	+	+		+	+	+	+		+	+	+		+	+	
11	C. nemoralis	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+					+				0	0													
12	C. glabratus																			+	+		+	+	+	+	+	+	+	+	+	+	+	+		+	+	+		+	+	
13	C. problematicus ...	+	+	+	+	+	+	+	+	+	+	+			+	+	+	+						+								+				+	+	+	+	+	
14	C. nitens			+	+		+													+			+	+		+	+	+	+		+	+	+	+	+	+	+	+	+	+	+
15	C. intricatus	+	+																												0			+			+	+	+	+		
16	C. violaceus	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
17	Cychrus caraboides ...	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
18	Leistus spinibarbis ...	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
19	L. montanus																																								
20	L. rufomarginatus ...										+																													+	0
21	L. fulvibarbis	+	+	+	+		+	+	+	+	+	+		+	+	+	+	+		+	+	+					+														
22	L. rufescens	+	?		+		+	+	+	+	+	+		+	+	+	+	+		+	+	+		+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	
23	L. ferrugineus ...	+	+	+	+	+	+	+	+	+	+	+			+	+	+	+		+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+		+	+	+
24	Eurynebria complanata	+	+	+																																					
25	Nebria brevicollis ...	+	+	+	+	+	+	+	+	+	+	+			+	+	+	+		+	+			+	+	+	+	+	+	+	+	+	+		+	+	+		+		
26	N. salina	+	+		+	+	+	+	+	+	+			+	+	+	+	+	+	+	+				+	+	+	+					+		+	+	+			+	+
27	N. rufescens																+	+		+	+			+		+				+						+	+	+			+	
28	N. nivalis																															?	+	+		+	+	+	+	+	+	+
29	N. livida																																								
30	Pelophila borealis ...		+																								+	+						+			+				
31	Notiophilus aestuans						+																										+									
32	N. aquaticus	+	+	+	+		+	+	+	+	+	+			+		+	+		+		+		+	+	+	+	+	+		+	+	+		+	+	+		+	+	+
33	N. germinyi		+		+		+	+	+	+	+																				+	+	+		+	+	+		+	+	+
34	N. palustris	+	+	+	+		+	+	+	+	+	+			+		+	+		+	+	+		+	+	+	+	+							+	+					
35	N. substriatus	+	+	+	+		+	+	+	+	+	+		+	+		+	+	+	+	+	+		+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+
36	N. rufipes		+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+		+	+	+	+	+			+	+		+	+	+	+	+	+	+	+
37	N. biguttatus	+	+	+	+	+	+	+	+	+	+	+		+	+		+	+		+	+			+	+	+	+	+	+		+	+			+	+		+			
38	N. quadripunctatus ...	+	+		+		+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
39	Blethisa multipunctata	+	+	+	+				+	+		+	+										+				+	+				+			+		+			+	
40	Elaphrus lapponicus ...																							+	+	+	+	+	0		+	+					+	+			+	
41	E. uliginosus	+	+	+	+		+			+							+	+			+		+		+	+												+			0	
42	E. cupreus	+	+	+	+	+	+	+	+	+	+	+			+		+	+		+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	
43	E. riparius	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+		+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	
44	Loricera pilicornis ...	+	+	+	+		+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41

	31	DERBY 32	STAFFORD 33	SHROPSHIRE 34	CHESHIRE 35	LANCASHIRE 36	YORKSHIRE 37	WESTMORLAND 38	DURHAM 39	CUMBERLAND 40	NORTHUMBERLAND 41	FLINT 42	DENBIGH 43	CARNARVON 44	ANGLESEY 45	MERIONETH 46	MONTGOMERY 47	CARDIGAN 48	RADNOR 49	BRECKNOCK 50	GLAMORGAN 51	CARMARTHEN 52	PEMBROKE 53	SCOTLAND I 54	SCOTLAND II 55	SCOTLAND III 56	SCOTLAND IV 57	SCOTLAND V 58	SCOTLAND VI 59	ISLE OF MAN 60	IRELAND 61
1																				+											
2					+	+				+						+															
3					+									+		+		+			+	+									
4	+	+	+	+	+	+	+	+	+	+						+				+	+	+	+	+		+	+	+		+	+
5																										?					
6			0	0		+				+						+				+		+									+
7	+	+	+			+	+		+	?										+	+			+	+		+				+
8	+	+		+		+	+	+	+	+				+		+				+	+			+		+	+	+		+	+
9	+	+	+		+	+	+		+	+										+	+			+			+	+	+	+	+
10																								+		+	+	+	+		+
11	−	+	+		+	+	+		+	+											+			+	+	+	+	+		+	−
12		+				+	−	+	+	+				+		+								+		+	+	+	+		+
13	−	+	+	+	+	+	+	+	+	+	+			+				+		+	+		+	+	+	+	+	+	+	+	+
14			+			+	+	+	+	+														+		+	+			+	+
15																										?					
16	−	+	+	+	+	+	−	+	+	+			+			+				+	+	+	+	+		+	+			−	+
17	+	+	+	+	+	+	−	+	+	+	+			+	+	+		+			+	+		+	+	+	+	+	+	−	−
18	+	+	+	+	+	+	−		+	+	+				+						+		+	+							+
19										+	0					+										+	+				−
20																															
21	+	+	+		+	+	+	+	+	+						+				+	+			−			+			+	+
22	+	+	+	+	+	+	+		+	+	+		+		+	+				+	+			−		+	+	+		+	+
23	+	+	+		+	+	+		+												+			+		+			+	−	+
24																					+	+	+								+
25			+	+	+	+	+			+	+		+	+	+	+		+		+	+		+	+	+	+	+	+	+	+	+
26	+				+	+	+			+					+			+					+			+	+		+	+	−
27	?	+	+		+	+	+	+	+	+	+			+										+		+	+	+	+	+	+
28																										+	+				
29			+				+																								
30		+																											+		+
31																										+					
32	+	+	+		+	+	+		+	+	+			+	+			+			+		−	+	+	+	+	+	+	+	+
33					+		+																			+	+	+			+
34	+	+	+		+	+	−	+	+	+								+			+		−	−		+		+		+	+
35	+	+		+	+	+	−	+	+	+	+			+	+	+		+			+			+		+	+		+	−	+
36	+								+												+	+									
37	+	+	+	+	+	+	−	+	+	+	+			+	+	+		+		+	+	+	+	+	+	+	+	+	+	+	+
38	+				+		+			+																					
39	+	+				+	+			+					+			+			+				+	+	+			+	−
40							−			0																+	+	+	+		
41		+																			+			0		+		+			+
42	+	+	+	+	+	+	+	+	+	+				+				+			+		+	+		+	+	+	+	+	+
43	+	+	+	+	+	+	+	+	+	+					+			+		+	+			+		+	+				+
44	+	+	+	+	+	+	+	+	+	+	+				+	+		+		+	+	+	+	+	+	+	+	+	+	+	+
	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61

	NAME OF SPECIES	CORNWALL S.I.	DEVON	SOMERSET	DORSET	WILTSHIRE	HAMPSHIRE I.W.	BERKSHIRE	SUSSEX	SURREY	KENT	ESSEX	MIDDLESEX	LONDON	HERTFORD	BUCKINGHAM	OXFORD	GLOUCESTER	MONMOUTH	HEREFORD	WORCESTER	WARWICK	NORTHAMPTON	BEDFORD	HUNTINGTON	CAMBRIDGE	SUFFOLK	NORFOLK	LINCOLN	RUTLAND	LEICESTER	NOTTINGHAM	DERBY	STAFFORD	SHROPSHIRE	CHESHIRE	LANCASHIRE	YORKSHIRE	WESTMORLAND	DURHAM	CUMBERLAND	NORTHUMBERLAND
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
45	Clivina fossor ...	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+			+	+	+	+	+	+	+	+	+	+	
46	C. collaris	+	+	+	+				+	+	+				+	+	+	+		+	+	+				+		+	+	+	+	+	+	+	+	+	+		+	+	
47	Dyschirius arenosus ...	+	+	+	+		+		+		+	+																+	+												
48	D. obscurus																											?														
49	D. nitidus								+		+	+											+			+	+	+	+							+	+	+			+	
50	D. politus		+		+		+	+	+	+	+	+	0		+		+	+								+	+	+			+					+	+	+	+		+	
51	D. impunctipennis ...	+	+	+	+						+																?	+	+								+	+			+	
52	D. extensus								+		+	+																													
53	D. salinus	+	+	+	+		+		+		+	+															+	+	+							+	+	+			+	
54	D. aeneus		+	+			+	+	+	+	+	+					+	+						+		+	+										+			+	
55	D. lūdersi			+	+				+	+	+	+									+				+	+	+														
56	D. augustatus						+				+																														0	0
57	D. globosus	+	+	+	+		+	+	+	+	+	+			+		+	+		+		+		+	+	+	+	+							+	+	+	+	+	+	
58	Broscus cephalotes ...	+	+	+	+		+		+		+	+						+						+		+	+	+			+	+	+			+	+		+	+	+
59	Miscodera arctica ...																																+	+	+	+	+	+			+	
60	Asaphidion pallipes ..	+	+		+							+																+		+							+				0	0
61	A. flavipes	+	+	+	+		+	+	+	+	—	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	
62	Bembidion argentiolum																																									
63	B. litorale				+							+					+	+	+	+	+				+			+				+			+	+	+		+	+	+
64	B. nigricorne ..				+		+		+	+																+								+		+	+	+		+	+	+
65	B. lampros	+	+	+	+	+	+	+	+	+	—	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+
66	B. properans		+		—		+	+	+	+	—		+	+	+	+	+		+		+	+		+		+		+				+			+		+			+	
67	B. punctulatum ..		+							+		+			+		+	+	+	+	+										+	+	+	+		+	+		+	+	
68	B. pallidipenne ..	+	+	+	+		+				—	+															+	+	+							+	+				+	+
69	B. bipunctatum ...	+							+	+	—		+									+				+	+						+	+	+	+	+	+		+	+	
70	B. dentellum	+	+	+	—		+	+	+	+	+	+	+		+	+	+	+		+	+	+	+	+	+	+	+	+			+	+	+	+	+	+	+		+		
71	B. varium	+	+	+	+		+	+	+		—	+	+		+			+		+				+		+	+	+			+			+		+				+	+
72	B. obliquum		+					+	+	+	—		+	+												+											+	+				
73	B. semipunctatum ...																	+		+	+	+				+													+			
74	B. ephippium	+			+		+		+		+	+															+	+													
75	B. prasinum								+										+	+	+														+		+	+		+	+	+
76	B. virens																																									
77	B. tibiale	+	+	+	—		+	+	+	+	—						+	+	+	+	+			+							+	+	+	+	+	+	+	+	+	+	+
78	B. geniculatum ..																																					+		+	+	
79	B. atrocoeruleum ...	+	+				+										+		+	+				+								+	+	+	+	+	+	+	+	+	+	
80	B. monticola		+	+					+									+		+	+												+	+	+	+	+	+		+	+	
81	B. nitidulum	+	+	+	—		+	+	+	+	—	+			+	+	+	+		+	+	+	+	+	+	+	+	+			+	+		+	+	+	+		+	+	
82	B. stephensi	+	+		+		+	+	+	+	—				+		+					+						+		+		+			+	+	+		+	+	—
83	B. lunatum	+								+		+					+	+		+			+			+	+	+			+	+			+	+	+		+	+	
84	B. bruxellense	+	+	+	+		+	+	+	+	+	+			+			+		+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	—
85	B. maritimum	+	+	+	+		+		+		—	+						+									+								+	+	+		+	+	—
86	B. tetracolum ...	+	+	+			+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+			+	+	+	+	+	+	+		+	+	—
87	B. femoratum	+	+			+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+		+		+	+	+	+		+	+	+	+	+	+	+		+	+	
88	B. andreae				+		+											+								+	+	+									+					
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41

NOTTINGHAM	DERBY	STAFFORD	SHROPSHIRE	CHESHIRE	LANCASHIRE	YORKSHIRE	WESTMORLAND	DURHAM	CUMBERLAND	NORTHUMBERLAND	FLINT	DENBIGH	CARNARVON	ANGLESEY	MERIONETH	MONTGOMERY	CARDIGAN	RADNOR	BRECKNOCK	GLAMORGAN	CARMARTHEN	PEMBROKE	SCOTLAND I	SCOTLAND II	SCOTLAND III	SCOTLAND IV	SCOTLAND V	SCOTLAND VI	ISLE OF MAN	IRELAND	
31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	
+	+	+	+	+	+	+	+	+	+				+						+	+		+	+		+	+	+	+	+	+	45
+	+	+	+	+	+	+		+	+				+							+			+		+				+	+	46
				+	+	+	.		+	+				+										+		+			+	+	47
																														+	48
				+	+	+			+						+								+								49
				+	+	+	+		+											+			+							+	50
					+	+			+					+	+		+			+			+			+	+			+	51
														+																	52
				+	+	+			+											+			+			+				+	53
						+																		+						?	54
																															55
									+	0															+						56
	+			+	+	+	+	+	+					+			+			+		+	+		+	+	+	+	+	+	57
+	+	+			+	+		+	+	+			+	+	+		+			+		+	+		+			+	+	+	58
	+	+	+	+	+	+			+			+	+											+	+	+					59
					+				0	0				+						+					+					+	60
+	+	+	+	+	+	+		+	+				+							+			+		+	+				+	61
																														+	62
	+			+	+	+		+	+	+										+					+	+	+	+	+	?	63
		+		+	+	+		+	+	+																				+	64
+	+	+	+	+	+	+	+	+	+	+			+				+		+	+		+	+	+	+	+			+	+	65
	+			+		+			+											+										+	66
+	+	+	+		+	+		+	+				+				+	+	+	+			+		+	+			+	+	67
				+	+				+	+				+	+		+			+			+		+	+		+	+	+	68
		+	+	+	+	+	+	+	+	+					+		+			+			+	+	+	+	+			+	69
+	+	+	+	+	+	+		+											+	+		+				+				+	70
			+	+		+			+	+										+		+	+							+	71
	+	+			+	+																									72
								+												0											73
																															74
			+		+	+		+	+	+		+						+	+	+			+		+	+					75
																											+				76
+	+	+	+	+	+	+	+	+	+	+		+	+		+		+		+	+			+	+	+	+	+		+	+	77
						+		+	+																+	+					78
	+	+	+	+	+	+	+	+	+						+		+	+	+	+			+		+	+	+	+		+	79
	+	+	+	+	+	+		+	+			0							+	+			+	+	+		+				80
+	+		+	+	+	+		+	+								+			+			+		+				+	+	81
	+			+	+	+		+	+	+										+			+							+	82
+	+				+	+		+	+											+			+	+	+					+	83
+	+	+	+	+	+	+	+	+	+	+					+					+			+	+	+	+	+	+		+	84
				+	+	+		+	+	+					+					+			+						+	+	85
+	+	+	+	+	+	+	+	+	+	+				+			+	+	+	+		+	+	+	+	+	+	+			86
+	+	+	+	+	+	+		+	+										+	+			+	+	+		+			+	87
						+		+	+														+	+	+					+	88
31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	

	NAME OF SPECIES	CORNWALL S.I.	DEVON	SOMERSET	DORSET	WILTSHIRE	HAMPSHIRE I.W.	BERKSHIRE	SUSSEX	SURREY	KENT	ESSEX	MIDDLESEX	LONDON	HERTFORD	BUCKINGHAM	OXFORD	GLOUCESTER	MONMOUTH	HEREFORD	WORCESTER	WARWICK	NORTHAMPTON	BEDFORD	HUNTINGDON	CAMBRIDGE	SUFFOLK	NORFOLK	LINCOLN	RUTLAND	LEICESTER	NOTTINGHAM	DERBY	STAFFORD	SHROPSHIRE	CHESHIRE	LANCASHIRE	YORKSHIRE	WESTMORLAND	DURHAM	CUMBERLAND	NORTHUMBERLAND	FLINT
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
89	B. saxatile	+	+		+		+		+		+						?	+									+	+						+		+	+		+	+	+	
90	B. testaceum		+						+	+								+	+	+								+									+					
91	B. fluviatile								+								+	+	+	+	+					+			+			+	+	+	+	+	+	+				
92	B. decorum	+	+	+	+		+		+	+		+			+	+	+	+		+	+			+			+	+				+	+	+		+	+	+		+	+	
93	B. genei	+	+	+	+		+	+	+	+	+	+			+	+	+	+		+	+	+	+	+	+	+	+	+				+	+		+	+	+		+	+	
94	B. atroviolaceum ...																			+								+														
95	B. nigropiceum ...	+	+		+		+		+		+	+															+								+	+			+	+	+	
96	B. laterale	+	+	+	+		+		+		+	+															+	+	+							+			+	+	+	
97	B. schuppeli																																				+			+	+		
98	B. gilvipes	+	+	+	+		+	+	+	+	+	+			+	+	+	+	+	+	+	+		+	+	+	+		+		+		+					+				
99	B. fumigatum ...	+					+		+		+	+		+	+	+									+	+	+	+			+											
100	B. assimile	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+							+	+	+	+	+			+						+				
101	B. clarki			+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+				+	+	+	+	+	+		+				+	+	+		+	+	
102	B. normannum ...	+	+	+	+		+		+		+	+								+						+	+	+	+						+	+	+					
103	B. minimum	+	+	+	+		+		+		+	+			+			+					+			+	+	+				+			+	+			+	+	
104	B. quadripustulatum ...							+	+	+	+	+			+			+						+		+	+	+				+									
105	B. quadrimaculatum ...	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+		+	+	+	+	+	+		+	+	+	+	+	+	+			+	+
106	B. doris		+	+	+		+	+	+	+	+	+			+	+						+		+		+	+	+			+										
107	B. articulatum ...	+	+	+	+		+	+	+	+	+	+	+		+	+	+	+		+	+	+		+	+	+	+	+	+		+	+	+	+							
108	B. octomaculatum ...						+			+	+																																
109	B. obtusum	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+		+	+	+		+	+	+	+	+	+	+		+	+	+	+	+	+	+		+	+	+
110	B. harpaloides ...	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+			+	+	+	+	+	+		+	+	+
111	B. quinquestriatum ...	+	+	+	+		+	+	+	+	+		+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+			+	+	+	+	+	+		+	+	
112	B. biguttatum	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+			+	+	+	+	+	+		+	+	
113	B. aeneum	+		+	+		+	+	+	+	+	+			+		+	+	+	+	+	+		+	+	+	+	+	+		+	+			+	+	+		+	+	
114	B. unicolor	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+		+	+	+		+	+	+	+	+	+			+	+	+	+	+	+	+	+	+	
115	B. guttula	+	+	+	+		+	+	+	+	+	+		+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+			+	
116	B. lunulatum	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+		+	+	+	+	+	+			+				+	+				
117	B. iricolor		+	+	+		+		+		+	+						+												+						+	+			+		
118	Tachys bistriatus ...		+	+	+		+		+	+	+				+	+		+																								
119	T. edmondsi						+																																			
120	T. micros				+																																					
121	T. scutellaris		+				+		+	+	+																+	+							+	+						
122	T. parvulus	+	+				+			+																																
123	T. walkerianus ...						+			+																										+		+					
124	Perileptus areolatus ...	+	+																	+																	+						
125	Aepopsis robinii ...	+	+		+		+		+																													+			+	+	
126	Aepus marinus ...	+	+	+	+		+																													+		+			+	+	0
127	Thalass. longicornis ...																																+	+			+				+	+	
128	Trechus secalis ...				+		+	+	+	+	+	+	+					+		+	+	+	+	+	+	+	+	+	+		+	+	+		+	+	+			+	
129	T. rivularis																								+	+																
130	T. subnotatus ...		+																																							
131	T. quadristriatus ...	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
132	T. obtusus	+	+	+	+	+	+	+	+	+	+	+					+	+	+	+	+	+		+	+	+	+		+			+		+	+	+	+	+	+	+	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42

	DERBY 32	STAFFORD 33	SHROPSHIRE 34	CHESHIRE 35	LANCASHIRE 36	YORKSHIRE 37	WESTMORLAND 38	DURHAM 39	CUMBERLAND 40	NORTHUMBERLAND 41
89			+		+	+		+	+	
90						+		+	+	+
91	+	+		+	+	+				
92	+	+	+		+	+	+	+	+	
93	+	+		+	+	+		+	+	
94				+	+	+		+	+	
95										
96				+	+			+	+	+
97						+		+	+	
98	+					+		+	+	
99						+				
100						+				
101					+	+		+		
102				+	+	+			+	
103	+			+	+	+		+	+	
104	+									
105	+	+	+	+	+	+				
106						+			+	+
107	+	+	+							
108										
109	+	+		+	+	+		+	+	
110	+	+	+	+	+	+	+	+	+	+
111	+	+		+	+	+		+	+	+
112	+	+	+	+	+	+		+	+	
113	+		+	+	+	+		+	+	
114	+	+		+	+	+	+	+	+	
115	+	+	+	+	+	+	+	+	+	
116				+	+	+			+	
117					+	+				
118					+	+		+		
119										
120										
121										
122				+	+					
123										
124			+		+					
125						+		+	+	+
126						+		+	+	+
127	+		+		+				+	0
128	+	+		+	+	+		+	+	
129										
130										
131	+	+	+	+	+	+	+	+	+	+
132	+		+	+	+	+	+	+	+	

	FLINT 42	DENBIGH 43	CARNARVON 44	ANGLESEY 45	MERIONETH 46	MONTGOMERY 47	CARDIGAN 48	RADNOR 49	BRECKNOCK 50	GLAMORGAN 51	CARMARTHEN 52	PEMBROKE 53
89				+						+		
90										+		
91										+		
92			+				+	+	+	+		
93										+		
94												
95												
96					+					+		
97												
98												
99										+		
100										+		+
101										+		
102									+	+		
103										+		
104												
105										+		
106									+	+		
107									+	+		
108												
109									+	+		
110			+	+					+	+		+
111										+		
112										+		
113										+		
114										+		
115				+			+		+	+		
116										+		
117										+		
118										+		
119												
120												
121												
122												
123												
124			+						+			
125				+								+
126										+		
127												
128												
129												
130												
131			+	+			+		+	+		
132			+	+						+		

	SCOTLAND I 54	SCOTLAND II 55	SCOTLAND III 56	SCOTLAND IV 57	SCOTLAND V 58	SCOTLAND VI 59	ISLE OF MAN 60	IRELAND 61
89	+		+				+	+
90	+							
91			+					
92	+	+	+	+			+	+
93	+							+
94	+		+					
95								
96	+	+		+				+
97	+	+	+				+	
98								+
99								
100								+
101	+	+						+
102								+
103	+							+
104								
105								
106	+	+	+					+
107								
108								
109	+		+	+			+	+
110	+			+		+	+	+
111	+	+	+			+	+	+
112	+	+		+				+
113	+	+	+	+				+
114	+	+		+	+		+	+
115	+		+	+	+		+	+
116							+	
117								
118								
119								
120								
121								
122								
123								
124	+							+
125		+	+				+	+
126	+	+	+	+				+
127	+							
128								
129								
130								+
131	+	+	+		+	+	+	+
132	+		+	+	+	+	+	+

	NAME OF SPECIES	CORNWALL S.I. 1	DEVON 2	SOMERSET 3	DORSET 4	WILTSHIRE 5	HAMPSHIRE I.W. 6	BERKSHIRE 7	SUSSEX 8	SURREY 9	KENT 10	ESSEX 11	MIDDLESEX 12	LONDON 13	HERTFORD 14	BUCKINGHAM 15	OXFORD 16	GLOUCESTER 17	MONMOUTH 18	HEREFORD 19	WORCESTER 20	WARWICK 21	NORTHAMPTON 22	BEDFORD 23	HUNTINGDON 24	CAMBRIDGE 25	SUFFOLK 26	NORFOLK 27	LINCOLN 28	RUTLAND 29	LEICESTER 30	NOTTINGHAM 31	DERBY 32	STAFFORD 33	SHROPSHIRE 34	CHESHIRE 35	LANCASHIRE 36	YORKSHIRE 37	WESTMORLAND 38	DURHAM 39	CUMBERLAND 40	NORTHUMBERLAND 41
133	T. rubens	+	+		+					+															+	+		+	+		+		+	+		+		+		+	+	+
134	T. fulvus	+	+		+		+		+		+	+															+									+				+	0	0
135	Lasiotrechus discus								+	+		+			+	+	+	+		+		+		+		+	+	+			+	+	+	+		+	+	+		+	+	
136	Trechoblemus micros		+	+	+		+		+		+				+		+	+		+	+	+		+	+	+	+	+	+		+	+	+			+	+	+		+	+	+
137	Pogonus luridipennis				+		+		+		+							+									+	0	+													
138	P. litoralis	+	+		+		+		+		+	+															+	+														
139	P. chalceus	+	+	+	+		+		+		+	+					?	+								+	+	+	+							+	+	+			+	
140	Patrobus septentrionis																																				+	+			?	+
141	P. assimilis		?		?																												+	+		+	+	+	+	+	+	
142	P. atrorufus		+	+	+	+	+	+	+	+	+	+			+	+	+	+	+	+	+	+		+		+	+	+	+		+	+	+	+		+	+	+	+	+	+	+
143	Panagaeus crux-major		+	+			+	+	+		+	+					+						+		+	+	?	+	0						+			+				
144	P. bipustulatus	+	+	+			+	+	+	+	+	+			+	+	+	+		+					+	+	+	+	+									+				
145	Callistus lunatus							+		+	+																															
146	Chlaenius tristis																								+	+		0					?					0				
147	C. nigricornis	+	+	+	+	+	+	+	+	+	+	+	+		+		+	+			+	+	+	+	+	+	+		+		+	+	+	+		+	+	+			+	
148	C. nitidulus				+		+		+																																	
149	C. vestitus	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+		+	+	+		+	+	+		+	+		+		+	+				+				
150	Oodes helopioides		+	+	+		+	+	+	+	+	+			+		+	?			+	+			+	+	+	+			+		+	+				+			+	
151	Badister unipustulatus		+	+	+	+	+		+	+	+				+		+	+			+				+	+	+		0		+	+										
152	B. bipustulatus	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+		+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	
153	B. sodalis	+	+	+	+		+	+	+	+	+	+	+		+	+	+	+		+	+	+		+	+	+	+	+	+		+	+	+					+		+	+	+
154	B. peltatus						+		+		+																															
155	B. anomalus				+				+		+																															
156	B. dilatatus	+			+		+		+	+	+		0														+		+													
157	Licinus punctatulus				+		+	+	+	+	+		+				+						+																			
158	L. depressus						+		+	+	+				+	+	+	+								+	+	+	+			+	+	+		+	+			+		
159	Perigona nigriceps							+						+																												
160	Harpalus affinis	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+		+	+	+	+	+	+			+	+			+	+	+		+	+	
161	H. cupreus						+				?																															
162	H. smaragdinus		+		+		+	+		+	+						+							+		+	+	+				+										
163	H. dimidiatus		+	+	+		+	+		+	+						+																									
164	H. melancholicus	+			+		+		+		+	+					+										+	+														
165	H. tenebrosus	+	+				+		+	+	+					+											?	+												+		
166	H. latus	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+		+	+	+	+	+			+	–	+		+	+	+	+	+	+	+	
167	H. quadripunctatus			0																																						+
168	H. rubripes	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+			+	+			+		+	+	+	+			+			+	+	+	+		+	+	
169	H. rufitarsis	+	+	+	+		+	+	+	+	+	+		+		+		+			+			+		+	+	+									+					
170	H. attenuatus	+	+	+	+		+	+	+	+	+	+		+													+	+					+			+		+				
171	H. neglectus	+	+		+		+																													+	+	+				
172	H. serripes	+	+	+	+		+		+		+	+															+	+								+						
173	H. tardus	+	+	+	+		+	+	+	+	+	+		+	+		+					+		+	+	+	+	+	+		+	+	+			+	+	+			+	
174	H. servus	+					+		+		+	+		+			+										+	+										+				
175	H. frölichi				+																						+											+		+		
176	H. anxius	+	+	+	+		+	+	+	+	+	+		+			+										+	+	+							+	+				+	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41

NOTTINGHAM 31	DERBY 32	STAFFORD 33	SHROPSHIRE 34	CHESHIRE 35	LANCASHIRE 36	YORKSHIRE 37	WESTMORLAND 38	DURHAM 39	CUMBERLAND 40	NORTHUMBERLAND 41	FLINT 42	DENBIGH 43	CARNARVON 44	ANGLESEY 45	MERIONETH 46	MONTGOMERY 47	CARDIGAN 48	RADNOR 49	BRECKNOCK 50	GLAMORGAN 51	CARMARTHEN 52	PEMBROKE 53	SCOTLAND I 54	SCOTLAND II 55	SCOTLAND III 56	SCOTLAND IV 57	SCOTLAND V 58	SCOTLAND VI 59	ISLE OF MAN 60	IRELAND 61	
	+	+		+		+		+	+	+			+							+			+	+	+	+	+	+		+	133
				+				+	0	0										+		+	0	0	+		0		+	+	134
+	+	+		+	+	+		+	+																					+	135
+	+			+	+	+		+	+	+					+								+	+	+				+	+	136
																															137
																				+										+	138
				+	+	+			+				+	+						+		+	+							+	139
					+	+			?	+															+	+				+	140
	+	+		+	+	+	+	+	+				+							+				+	+			+	+	+	141
+	+	+		+	+	+	+	+	+	+			+				+		+	+			+		+		+			+	142
			+			+														+										+	143
						+																									144
																															145
	?					0														?										+	146
+	+	+		+	+	+			+											+		+		+						+	147
																															148
	+	+				+														+										+	149
	+	+				+			+													+									150
+																														+	151
+	+	+	+	+	+	+	+	+	+					+					+	+		+	+		+	+		+	+	+	152
+	+					+		+	+	+									+	+			+							+	153
																															154
																															155
																														+	156
																															157
+	+	+		+	+			+												+											158
																															159
+	+			+	+	+		+	+				+						+	+		+	+		+	+	+		+	+	160
																															161
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													+							+		+								+	164
								+												+											165
+	+		+	+	+	+	+	+	+				+						+	+	+	+	+		+	+	+		+	+	166
										+															+			+		+	167
+			+	+	+	+		+	+				+		+					+		+				+			+	+	168
					+																								+	+	169
	+			+		+														+			+								170
				+	+	+					+			+	+					+										+	171
				+																+											172
+	+			+	+	+			+					+					+	+		+	+	+	+				+	+	173
						+														+											174
						+		+																							175
				+	+				+											+		+							+	+	176
31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	

	NAME OF SPECIES	CORNWALL S.I. 1	DEVON 2	SOMERSET 3	DORSET 4	WILTSHIRE 5	HAMPSHIRE I.W. 6	BERKSHIRE 7	SUSSEX 8	SURREY 9	KENT 10	ESSEX 11	MIDDLESEX 12	LONDON 13	HERTFORD 14	BUCKINGHAM 15	OXFORD 16	GLOUCESTER 17	MONMOUTH 18	HEREFORD 19	WORCESTER 20	WARWICK 21	NORTHAMPTON 22	BEDFORD 23	HUNTINGDON 24	CAMBRIDGE 25	SUFFOLK 26	NORFOLK 27	LINCOLN 28	RUTLAND 29	LEICESTER 30	NOTTINGHAM 31	DERBY 32	STAFFORD 33	SHROPSHIRE 34	CHESHIRE 35	LANCASHIRE 36	YORKSHIRE 37	WESTMORLAND 38	DURHAM 39	CUMBERLAND 40	NORTHUMBERLAND 41
177	H. picipennis		+		+		+		+			+	+													+	+	+														
178	H. sabulicola	+	+		+		+	+	+	+	+	+			+											+	+															
179	H. obscurus				+							+					+	+								+	?															
180	H. ardosiacus	+	+	+	+		+	+	+	+	+	+				+	+							+		+	+	+										+				
181	H. punctatulus ...	+	+	+	+		+	+	+	+	+	+			+	+	+						+	+		+	+	+				+										
182	H. azureus	+	+	+	+		+	+	+	+	+	+			+	+	+	+			+			+		+	+	+		+		+										
183	H. puncticeps ...	+	+				+	+	+	+	+	+				+	+	+										+										+				
184	H. puncticollis... ...			+	+			+																		+																
185	H. melleti				+		+		+	+	+							+									+															
186	H. brevicollis									+																																
187	H. subpunctatus ...		+	+		+	+	+	+	+		+	+	+	+		+	+		+	+	+		+		+	+		+									+				
188	H. schaubergerianus ..				+		+	+		+						+	+			+						+																
189	H. rupicola			+	+		+	+	+	+	+	+			+	+	+				+					+	+	+					+	+			+	+				
190	H. cordatus				+		+		+		+							+																								
191	H. rufipes	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+		+	+		+	+	+	+	+	+	+	+
192	Stenolophus teutonus...			+	+		+	+	+	+	+			+		+		+								+																
193	S. skrimshiranus ...	+		+			+		+	+	+	+													+	+		+														
194	S. mixtus	+		+	+		+	+	+	+	+	+	+		+		+	+	+	+	+				+	+	+	+	+		+					+	+	+		+		
195	S. plagiatus																																									
196	Acupalpus elegans ..										+	+																										+				
197	A. flavicollis		+		+		+	+		+	+															+																
198	A. brunneipes				+		+	+		+					+																											
199	A. meridianus	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+		+	+	+	+		+	+	+				
200	A. dorsalis	+		+	+		+	+	+	+	+	+			+	+								+	+	+	+	+	+		+	+	+				+	+				
201	A. dubius	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+			+		+		+	+	+	+	+	+			+	+					+				
202	A. exiguus	+	+	+	+		+	+	+	+	+	+			+	+	+	+		+		+	+		+	+					+		+			+		+			+	
203	Anthracus consputus ...	+	+		+		+	+	+	+	+	+	+		+	+	+	+	+	+	+			+	+	+	+				+	+					+	+				
204	Bradycellus ruficollis ...	+	+	+	+		+	+	+	+	+	+		+	+	+	+								+		+	+	+		+	+	+		+	+	+	+	+	+	+	
205	B. distinctus				+		+	+									?																			+						
206	B. sharpi		+	+	+			+	+	+	+		+	+			+	+			+					+																
207	B. verbasci	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+		+		+		+	+	+	+	+	+	+	+	+	+	+		+	+	+		+	+	
208	B. harpalinus ..	+	+	+	+		+	+	+	+	+	+	+		+	+	+	+		+	+	+		+	+	+	+	+	+		+	+	+	+		+	+	+		+	+	
209	B. collaris																									+		+			+	+	+	+		+	+	+		+	+	
210	Trichocellus cognatus						+															+			+	+		+	+		+	+	+	+	+	+	+	+		+	+	
211	T. placidus		+		+			+	+		+				+	+	+				+				+	+	+	+			+	+	+			+		+		+	+	
212	Dicheirotrichus gustavi	+	+	+	+		+		+		+	+						+									+	+	+		?					+	+	+		+	+	
213	D. obsoletus	+	+		+		+		+		+	+															+	+	+													
214	Scybal. oblongiusculus				+																																					
215	Anisod. poeciloides ...	+	+		+		+				+	+																														
216	A. binotatus	+	+	+	+		+	+	+	+	+	+				+		+						+		+	+	+	+		+		+			+	+	+			+	
217	A. nemorivagus ...				+		+	+		+			+															+														
218	Amara strenua ...			+			+				+	+																					?									
219	A. plebeja	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+		+		+		+	+	+	+	+	+		+	+	+	+		+	+	+		+	+	
220	A. similata	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+		+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41

DERBY 32	STAFFORD 33	SHROPSHIRE 34	CHESHIRE 35	LANCASHIRE 36	YORKSHIRE 37	WESTMORLAND 38	DURHAM 39	CUMBERLAND 40	NORTHUMBERLAND 41	FLINT 42	DENBIGH 43	CARNARVON 44	ANGLESEY 45	MERIONETH 46	MONTGOMERY 47	CARDIGAN 48	RADNOR 49	BRECKNOCK 50	GLAMORGAN 51	CARMARTHEN 52	PEMBROKE 53	SCOTLAND I 54	SCOTLAND II 55	SCOTLAND III 56	SCOTLAND IV 57	SCOTLAND V 58	SCOTLAND VI 59	ISLE OF MAN 60	IRELAND 61	
																														177
																			+											178
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+	+		+	+	+		+	+				+	+			+			+	+		+		+			+	+	+	208
			+	+	+		+	+				+								+		+	+	+					+	209
+	+	+	+	+	+		+	+			+	+										+	+	+		+		+	+	210
+			+		+		+	+														+		+	+	+	+		+	211
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+	+	+	+	+	+		+	+						+					+			+							+	220
32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	

	NAME OF SPECIES	CORNWALL S.I. 1	DEVON 2	SOMERSET 3	DORSET 4	WILTSHIRE 5	HAMPSHIRE I.W. 6	BERKSHIRE 7	SUSSEX 8	SURREY 9	KENT 10	ESSEX 11	MIDDLESEX 12	LONDON 13	HERTFORD 14	BUCKINGHAM 15	OXFORD 16	GLOUCESTER 17	MONMOUTH 18	HEREFORD 19	WORCESTER 20	WARWICK 21	NORTHAMPTON 22	BEDFORD 23	HUNTINGDON 24	CAMBRIDGE 25	SUFFOLK 26	NORFOLK 27	LINCOLN 28	RUTLAND 29	LEICESTER 30	NOTTINGHAM 31	DERBY 32	STAFFORD 33	SHROPSHIRE 34	CHESHIRE 35	LANCASHIRE 36	YORKSHIRE 37	WESTMORLAND 38	DURHAM 39	CUMBERLAND 40	NORTHUMBERLAND 41
221	A. ovata	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	
222	A. montivaga		+						+	+	+	+				+																										
223	A. nitida			+	+								+									+							+													
224	A. communis	+	+	+	+		+	+	+	+	+	+			+	+	+	+	+	+	+	+		+	+	+	+	+	+		+	+	+	+		+	+	+	+	+	+	
	v. convexior	+	+	+	+		+	+	+	+	+	+		+	+		+	+		+	+	+				+	+				+				+			+				
225	A. lunicollis	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+		+	+	+			+		+	+	+	+	+	+	+	+	+	
226	A. curta						+		+		+																						+				+	+				
227	A. aenea	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	
228	A. spreta				+		+		+	+	+										+						+							+						+		
229	A. famelica						+	+		+																																
230	A. eurynota	+	+	+	+			+	+	+	+		+	+	+	+	+	+				+	+	+	+	+	+	+				+	+	+		+	+	+		+	+	0
231	A. familiaris	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+		+	+	+		+	+	
232	A. anthobia						+	+		+	+		+	+			+				+	+		+	+	+	+				+			+						+		
233	A. lucida	+	+	+	+		+		+	+	+	+	+			+	+								+	+	+	+	+							+	+	+		+	+	
234	A. tibialis	+	+	+	+		+	+	+	+	+	+		+	+		+	+		+	+	+				+	+	+	+			+	+	+	+	+	+	+		+	+	
235	A. complanata ...								+		+																											0				0
236	A. quenseli																																									
237	A. bifrons	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+		+	+	+		+		+	+	+	+		+	+	+	+		+	+	+		+	+	
238	A. praetermissa ...			+			+		+	+	+						+							+	+	+	+	+									+	+		+		
239	A. infima				+		+			+	+													+					+													
240	A. apricaria	+	+	+	+		+	+	+	+	+	+		+	+	+	+	+		+	+	+		+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	
241	A. fulva	+		+	+		+	+	+	+	+						+			+		+		+		+	+	+	+	+		+				+	+	+		+	+	
242	A. consularis		+	+	+	+	+	+	+	+	+		+			+	+	+			+	+			+	+	+	+	+			+	+	+		+	+	+		+	+	0
243	A. aulica	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+		+	+	+	+	+	+	+		+	+	+	+		+	+	+	+	+	+	
244	A. convexiuscula ...	+	+	+	+		+		+		+	+	+		+	+								+		+	+	+	+		+						+	+		+		
245	A. alpina																																									
246	A. equestris	+	+		+			+		+	+						+	+								+	+							+	+						+	
247	Zabrus tenebrioides ...		+		+		+		+	+	+	+	+										+			+	+				+											
248	Stomis pumicatus ...	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+		+	+	+		+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	
249	Pterostichus kugelanni		+		+		+	0	+	+	+															+	+	0														
250	P. lepidus				+		+	+		+	+				0		+						+			+		0						+				+			+	
251	P. cupreus	+	+	+	+		+	+	+	+	+	+	+		+	+	+	+		+	+	+	+	+	+	+	+	+	+		+	+	+	+		+	+	+	+	+	+	
252	P. caerulescens ...	+	+	+	+	+	+	+	+	+	+	+			+	+	+	+	+	+	+	+		+	+	+	+		+		+	+	+	+	+	+	+	+	+	+	+	
253	P. longicollis		+	+	+		+	+	+	+	+	+					+	+		+	+	+			+	+	+		+		+	+						+				
254	P. vernalis	+	+	+	+		+	+	+	+	+	+	+		+		+	+	+	+	+	+		+		+	+	+	+		+	+	+		+	+	+	+	+	+	+	
255	P. macer			+	+		+	+	+	+	+	+	+				+	+			+	+		+		+	+		+		+	+	+		+		+	+		+		
256	P. aterrimus																								+	+		+														
257	P. adstrictus																																+		+	+	+	+	+	+	+	
258	P. oblongopunctatus ...	+	+	+	+	+	+	+									+	+		+	+		0						+		+		+					+				
259	P. angustatus				+			+	+	+	+	+																				+				+	+	+				
260	P. niger	+	+	+	+		+	+	+	+	+	+	+		+	+	+	+		+		+	+	+	+	+	+	+	+		+	+	+	+		+	+	+	+	+	+	
261	P. melanarius	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
262	P. nigrita	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	
263	P. anthracinus	+	+	+	+		+	+	+	+	+				+	+	+	+	+	+	+	+		+	+	+	+	+	+		+		+					+			+	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	

DERBY	STAFFORD	SHROPSHIRE	CHESHIRE	LANCASHIRE	YORKSHIRE	WESTMORLAND	DURHAM	CUMBERLAND	NORTHUMBERLAND	FLINT	DENBIGH	CARNARVON	ANGLESEY	MERIONETH	MONTGOMERY	CARDIGAN	RADNOR	BRECKNOCK	GLAMORGAN	CARMARTHEN	PEMBROKE	SCOTLAND I	SCOTLAND II	SCOTLAND III	SCOTLAND IV	SCOTLAND V	SCOTLAND VI	ISLE OF MAN	IRELAND	
32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	
+	+	+	+	+	+	+	+	+										+	+		+	+		+	+			+	+	221
																+								+						222
																														223
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		+			+													+	+			+							+	
+	+	+	+	+	+	+	+	+					+						+		+	+	+	+		+		+	+	225
+				+	+																								+	226
+	+		+	+	+	+	+	+			+	+	+	+		+		+	+		+	+			+			+	+	227
	+						+							+					+											228
																														229
+	+		+	+	+		+	+	0				+						+			+		+	+			+	+	230
+	+		+	+	+		+	+					+						+	+	+	+	+		+		+	+	+	231
	+						+																							232
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					0				0										0											235
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				+	+		+							+					+			0	+	+					+	238
																														239
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			+	+	+		+	+						+					+			+		+	+			+	+	241
+	+		+	+	+		+	+	0													+		+				+	+	242
+	+		+	+	+	+	+	+					+	+					+		+	+		+	+	+	+	+	+	243
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	+				+			+											+			+		+	+	+			+	250
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+	+	+	+	+	+	+	+	+	+				+	+		+			+		+	+		+	+	+		+	+	252
					+														+											253
+		+	+	+	+	+	+	+			+	+		+		+			+		+	+		+	+				+	254
+		+		+	+		+												+										+	255
																													+	256
+		+	+	+	+	+	+	+	0		0	+							+					+	+	+	+	+	+	257
+					+							+		+		+		+						+					+	258
			+	+	+																									259
+	+		+	+	+	+	+	+				+				+		+	+	+	+	+		+	+	+	+	+	+	260
+	+	+	+	+	+	+	+	+	+			+				+		+	+			+		+	+			+	+	261
+	+	+	+	+	+	+	+	+	+		+	+	+	+		+		+	+		+	+	+	+	+	+	+	+	+	262
+					+			+														+							+	263
32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	

No.	AME OF SPECIES	CORNWALL S.I. 1	DEVON 2	SOMERSET 3	DORSET 4	WILTSHIRE 5	HAMPSHIRE I.W. 6	BERKSHIRE 7	SUSSEX 8	SURREY 9	KENT 10	ESSEX 11	MIDDLESEX 12	LONDON 13	HERTFORD 14	BUCKINGHAM 15	OXFORD 16	GLOUCESTER 17	MONMOUTH 18	HEREFORD 19	WORCESTER 20	WARWICK 21	NORTHAMPTON 22	BEDFORD 23	HUNTINGDON 24	CAMBRIDGE 25	SUFFOLK 26	NORFOLK 27	LINCOLN 28	RUTLAND 29	LEICESTER 30	NOTTINGHAM 31	DERBY 32	STAFFORD 33	SHROPSHIRE 34	CHESHIRE 35	LANCASHIRE 36	YORKSHIRE 37	WESTMORLAND 38	DURHAM 39	CUMBERLAND 40	NORTHUMBERLAND 41	FLINT 42
64	P. gracilis	+	+	+	+		+	+	+	+	+	+			+	+	+				+				+	+	+		+				+	+		+		+					
65	P. minor	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+		+		+		+	+	+	+	+	+	+	+	+	+			+	+	+	+		+		
66	P. strenuus	+	+	+	+		+	+	+	+	+	+		+	+	+	+	+	+	+	+	+		+	+	+	+	+	+			+	+	+	+	+	+	+	+	+	+	+	
67	P. diligens	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+		+	+	+		+	+	+	+	+	+			+	+	+	+	+	+	+	+	+	+	+	
68	P. aethiops	+	+	+																																	+	+		+	+	0	
69	P. madidus	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
270	P. cristatus		?																																					+	+	+	
271	Abax parallelepipedus	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+		+		+	+	+	+	+	+			+	+	+	+	+	+	+	+	+	+		
272	Platyderus ruficollis ...		+	+	+		+	+	+	+	+	+	+	+	+		+				+	+		+	+	+	+	+	+	+		+	+	+	+			+		+			
273	Calathus fuscipes ...	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+		+	+	+		+	+	+	+	+	+		+	+	+	+		+	+	+	+	+	+	+	
274	C. erratus	+	+	+	+		+	+	+	+	+		+	+	+	+				+		+		+	+	+	+	+	+			+			+	+	+	+		+	+		
275	C. ambiguus	+	+		+		+	+	+		+	+	+				+					+		+		+	+	+	+			+		+			+	+		+	+		
276	C. melanocephalus ...	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+			+	+	+		+	+	+	+	+	+	+	
277	C. mollis	+	+	+	+		+		+		+	+												+			+	+	+						+	+	+	+		+	+	+	
278	C. micropterus ...	+	+	+																												+			+			+	+	+	+	+	
279	C. piceus	+	+	+	+		+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+		+	+	+	+		+	+	+	+		+	+	+	+	+	+		
280	Sphod. leucophthalmus	+	+				+	+	+	+	+	+	+	+			+									+	?	+	0		+		+	+		+	+	+		+	0	0	
281	Laemostenus terricola	+	+	+	+		+	+	+	+	+	+		+	+	+	+	+		+		+		+		+	+	+	+			+	+	+	+	+	+	+		+	+		
282	L. complanatus ...	+	+		+		+		+		+			+													+		+								+	+			+		
283	Synuchus nivalis ...	+	+	+	+		+	+	+	+	+	+		+	+		+	+			+	+		+	+	+	+	+	+			+	+	+	+	+	+	+		+	+	0	
284	Odontonyx rotundatus	+	+	+	+		+	+	+	+	+	+	+		+	+	+	+		+		+		+	+	+	+	+	+			+	+	+	+	+	+	+	+	+	+		
285	Agonum 4-punctatum				+			+		+	+																														0		
286	A. sexpunctatum ...		+		+		+	+		+	+	+			+		+				+					+		+				+		+						+	+		
287	A. ericeti						+																														+	+		0	0		
288	A. gracilipes																									+	+	+										+					
289	A. marginatum ...	+	+	+	+		+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+			+	+	+		+	+	+		+	+		
290	A. mülleri	+	+	+	+		+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+			+	+	+	+	+	+	+	+	+	+		
291	A. versutum				+		+	+	+	+	+	+					+	+						+		+							+					+					
292	A. nigrum	+	+	+	+		+			+	+	+					+	+				+				+	+	+			+	+	+			+				+	+		
293	A. viduum	+	+	+	+	+	+	+	+	+	+	+			+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+		+	+	+	
294	A. moestum	+	+	+	+	+	+	+	+	+	+	+				+	+	+	+	+	+	+		+	+	+	+	+	+			+	+	+	+	+	+	+		+	+		
295	A. sahlbergi																																										
296	A. livens						+	+	+	+	+		+				+								+	+					+	+											
297	A. assimile	+	+		+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+		+		+	+	+	+	++	+	+	+	+	+	+		
298	A. ruficorne	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
299	A. obscurum	+	+	+	+		+	+	+	+	+	+	+		+	+	+	+	+	+	+	+		+	+	+	+	+			+	+						+		+			
300	A. dorsale	+	+	+	+		+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+		+	+		
301	A. scitulum		+	+	+		+	+		+	+										+												+		+			+					
302	A. micans	+	+		+		+	+	+	+	+	+	+		+	+	+	+		+	+	+	+	+	+	+	?				+	+	+		+		+	+		+	+	+	
303	A. fuliginosum ...	+	+	+	+		+	+	+	+	+	+		+	+	+	+	+	+	+	+	+		+	+	+	+	+	+			+	+	+	+	+	+	+	+	+	+	+	
304	A. piceum	+	+	+	+			+	+	+	+	+		+	+	+	+	+			+	+		+	+	+	+		+		+	+	+	+	+			+		+	+	0	
305	A. gracile	+	+	+	+		+	+	+	+	+	+	+		+		+	+		+	+	+		+	+	+		+	+		+		+	+	+	+	+	+	+	+	+	+	
306	A. thoreyi	+	+	+	+		+	+	+	+	+	+		+	+	+	+	+		+	+	+		+	+	+	+	+	+		+	+	+	+		+	+	+					
307	Odacantha melanura ...	+		+			+	+	+	+	+	+													+	+	+	+															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	

DERBY	STAFFORD	SHROPSHIRE	CHESHIRE	LANCASHIRE	YORKSHIRE	WESTMORLAND	DURHAM	CUMBERLAND	NORTHUMBERLAND	FLINT	DENBIGH	CARNARVON	ANGLESEY	MERIONETH	MONTGOMERY	CARDIGAN	RADNOR	BRECKNOCK	GLAMORGAN	CARMATHEN	PEMBROKE	SCOTLAND I	SCOTLAND II	SCOTLAND III	SCOTLAND IV	SCOTLAND V	SCOTLAND VI	ISLE OF MAN	IRELAND	
32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	
+	+		+		+																			+					+	264
+			+	+	+	+		+								+		+	+		+	+		+				+	+	265
+	+	+	+	+	+	+	+	+	+		+	+	+			+		+	+		+	+		+	+		+	+	+	266
+	+	+	+	+	+	+	+	+	+		+	+				+		+	+		+	+		+	+	+	+	+	+	267
				+	+		+	+	0			+		+		+			+				+	+	+					268
+	+	+	+	+	+	+	+	+	+	+	+	+	+			+		+	+	+	+	+	+	+	+	+	+	+	+	269
							+	+	+																					270
+	+	+	+	+	+	+	+	+								+		+	+	+	+	+			+	+	+	+	+	271
+	+	+			+		+																						+	272
+	+		+	+	+	+	+	+	+			+	+					+	+		+	+	+	+	+	+	+	+	+	273
		+	+	+	+		+	+					+						+		+	+		+		+	+	?	+	274
	+			+	+		+	+											+								+			275
+	+		+	+	+	+	+	+	+		+	+	+	+		+		+	+	+	+	+	+	+	+	+	+	+	+	276
		+	+	+	+		+	+	+			+	+			+		+	+		+	+		+	+	+		+	+	277
		+			+	+	+	+	+		0	+											+	+	+	+			+	278
+	+		+	+	+	+	+	+				+						+	+			+		+	+	+		+	+	279
+	+		+	+	+		+	0	0										+			+							+	280
+	+	+	+	+	+		+	+					+						+		+	+		+	+			+	+	281
				+	+			+														+	+						+	282
+	+	+	+	+	+		+	+	0			+						+	+		+	+		+	+		0	+	+	283
+	+	+	+	+	+	+	+	+				+							+		+	+	+	+	+	+	+	+	+	284
								0																						285
	+						+	+											+											286
				+	+		0	0						+		+						+	+	+						287
					+																								+	288
+	+		+	+	+		+	+					+	+		+		+	+		+	+			+		+	+	+	289
+	+	+	+	+	+	+	+	+				+	+	+		+		+	+		+	+		+	+	+	+	+	+	290
+					+																	+		+					+	291
+			+				+	+											+			+							+	292
+	+	+	+	+	+		+	+	+					+					+		+	+			+				+	293
+	+	+	+	+	+		+	+								+			+		+								+	294
																						+			+					295
																														296
+	+	++	+	+	+	+	+	+								+		+	+		+	+		+	+				+	297
+	+	+	+	+	+	+	+	+	+			+		+		+	+	+	+	+	+	+		+	+	+	+	+	+	298
					+		+												+									+	+	299
+	+		+	+	+		+	+								+		+	+		+	+		+				+	+	300
+		+			+									+										+					+	301
+		+		+	+		+	+	+			+							+									+	+	302
+	+	+	+	+	+	+	+	+	+			+				+			+		+	+			+		+	+	+	303
+	+	+			+		+	+	0							+			+			+		+	+	+			+	304
+	+	+	+	+	+	+	+	+	+		+			+		+		+	+		+	+	+	+	+			+	+	305
+	+		+	+	+									+		+			+										+	306
																			+											307
32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	

NAME OF SPECIES	CORNWALL S.I.	DEVON	SOMERSET	DORSET	WILTSHIRE	HAMPSHIRE I.W.	BERKSHIRE	SUSSEX	SURREY	KENT	ESSEX	MIDDLESEX	LONDON	HERTFORD	BUCKINGHAM	OXFORD	GLOUCESTER	MONMOUTH	HEREFORD	WORCESTER	WARWICK	NORTHAMPTON	BEDFORD	HUNTINGDON	CAMBRIDGE	SUFFOLK	NORFOLK	LINCOLN	RUTLAND	LEICESTER	NOTTINGHAM	DERBY	STAFFORD	SHROPSHIRE	CHESHIRE	LANCASHIRE	YORKSHIRE	WESTMORLAND	DURHAM	CUMBERLAND	NORTHUMBERLAND	FLINT
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
308 Masoreus wetterhali ...	+			+				+		+	+																+														
309 Lebia cyanocephala ...		+		+	+	+			+	+					+								+										+			+				
310 L. chlorocephala ...	+	+	+	+		+	+	+	+	+	+			+	+	+	+		+	+	+	+	+	+	+	+	+	+			+	+	+	0	+	+		+	+	0
311 L. crux-minor	+	+				+	0	+	+	+							0																+								
312 Demetrias monostigma	+	+		+						+	+											+		+	+	+	+	+								+					
313 D. atricapillus ...	+	+	+	+	+	+	+	+	+	+	+			+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+		+	+	
314 D. imperialis						+		+		+	+													+	+	+	+													
315 Dromius longiceps ...																								+	+	+	+	+												
316 D. linearis	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
317 D. agilis	+	+	+	+		+	+		+	+	+					+	+		+	+	+		+	+	+	+	+			+	+	+			+		+	+	
318 D. angustus		+				+	+		+							+									+	+														
319 D. meridionalis ...	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+		+	+	+	+			+	+	+	+	+	+	+	+	+	
320 D. quadrimaculatus ...	+	+	+	+		+	+	+	+	+	+	+		+	+	+	+		+	+	+	+	+	+	+	+	+	+			+	+	+	+	+	+	+	+	+	
321 D. quadrinotatus ...	+	+	+	+		+	+	+	+	+	+			+	+	+	+		+	+	+		+	+	+	+	+	+			+	+	+	+	+	+	+	+	+	
322 D. quadrisignatus ...	+	+				+	+	+	+	+						+	+				+			+		+														
323 D. vectensis		+		+		+		+	+	+																														
324 D. sigma						+			+	+		+												+	0	+															
325 D. melanocephalus ...	+	+	+	+	+	+	+		+	+	+	+		+	+	+	+		+	+	+		+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+
326 D. notatus	+	+	+	+		+		+	+	+	+	0			+									+	+	+	+														
327 Metab. obscuroguttatus	+	+	+	+		+	+	+	+	+	+					+	+			+	+				+	+	+								+					
328 M. truncatellus ...	+		+	+		+	+	+	+	+	+	0		+		+	+			+	+		+	+	+	+	+					+								
329 M. foveatus	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+		+		+	+	+	+	+													
330 Microlestes maurus ...	+	+	+	+		+	+	+	+	+	+	+		+	+	+	+		+		+		+	+	+	+	+													
331 Lionychus quadrillum	+	+		+		+				+	+			+	+	+	+		+		+		+	+	+	+														
332 Cymindis axillaris ...		+		+		+		+	+	+																+	0	+												
333 C. vaporariorum ...																																+	+		+	+	+		+	+	+
334 Polistichus connexus ...				+		+	+	+		+	+															+	+														
335 Drypta dentata ...				+		+		+		+																														
336 Brachinus crepitans ...	+	+	+	+		+	+	+	+	+	+			+	+	+							+	+	+	+		+												
CASUAL / DOUBTFUL SPECIES																																									
1 Calosoma sycophanta	+	+		+		+		0		+	+														+	+	+												+	+	
2 Carabus auratus ...		+						+		+		+	+													+														
3 C. cancellatus										0															0																
4 Bembidion callosum ...									0																																
5 Tachys bisulcatus ...																																						0			
6 T. quadrisignatus ...																																						0			
7 Harpalus honestus ...	?		?	?		?	?		?							?	?									?													?	
8 H. calceatus																																									
9 Stenol. abdominalis						?																															0				
10 Diachromus germanus	0	0						0		0																																
11 Amara cursitans ...																																									
12 Abax parallelus ...	+																																								
13 Lebia scapularis ...								+																																	
14 L. marginata		0																																0							
15 Brachinus sclopeta ...		0						?		0	0																														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42

	DERBY	STAFFORD	SHROPSHIRE	CHESHIRE	LANCASHIRE	YORKSHIRE	WESTMORLAND	DURHAM	CUMBERLAND	NORTHUMBERLAND	FLINT	DENBIGH	CARNARVON	ANGLESEY	MERIONETH	MONTGOMERY	CARDIGAN	RADNOR	BRECKNOCK	GLAMORGAN	CARMARTHEN	PEMBROKE	SCOTLAND I	SCOTLAND II	SCOTLAND III	SCOTLAND IV	SCOTLAND V	SCOTLAND VI	ISLE OF MAN	IRELAND
	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61
308																														
309			+			+																							+	
310	+	+	+	0	+	+		+	+	0					+					+			+				0			+
311			+						+														0							+
312						+									+					+										
313	+	+	+	+	+	+		+	+					+	+					+		+							+	+
314																														
315																														
316	+	+	+	+	+	+	+	+	+	+				+	+					+		+	+						+	+
317	+	+			+	+		+	+										+	+			+	+	+	+				+
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ON SOME PARASITIC *DIPTERA* AND *HYMENOPTERA* BRED FROM *LEPIDOPTEROUS* HOSTS

PART III

RECORDS OF TACHINIDAE (DIPT.), BRACONIDAE, ICHNEUMONIDAE, ENCYRTIDAE, PTEROMALIDAE, EULOPHIDAE AND SCELIONIDAE (HYM.)

By H. E. HAMMOND, F.R.E.S.,
and
KENNETH G. V. SMITH, M.I.Biol., F.R.E.S.

Regarding our comments on *Actia bicolor* (Mg.) in Part II of this paper (Hammond and Smith, 1955: 172), Mr. E. C. M. d'Assis Fonseca informs us (*in litt.*) that: '*Actia bicolor* seems to be by no means uncommon in the Southern Counties. I have taken it in East Kent and South Cornwall, and in April, 1950, it was quite abundant in Walton Moors, Clevedon, Somerset N., the males swarming around a young silver birch on nearby vegetation. Since that year, however, it has not again appeared in the same locality.'

Messrs. A. W. Stelfox and J. F. Perkins have written to say that in their experience it is the male of *Alomya debellator* (F.) that is found most commonly in the field, the female being difficult to find as with many other Ichneumonids.

For the present paper Mr. S. E. W. Carlier kindly allowed us to examine the parasites which he had bred from *Ypsolophus* (= *Cerastoma*) *parenthesellus* (L.). Previously only two parasites were known from this host, *Hemiteles areator* (Pz.) and *Labrorhychus clandestinus* (Grav.) (the former species may well have been a hyperparasite). From 27 larvae of *Y. parenthesellus* Mr. Carlier bred 11 moths and the following parasites: *Macrocentrus marginator* (Nees), *Lissonata palpalis* Thoms., *Campoplex* (= *Omorgus*) *picticruris* Thoms., *Copidosoma* sp. near *flagellare* (Dalm.) and *Tyndarichus scaurus* (Wlk.). These are dealt with fully in the parasite list below. Several parasites from *Eupithecia* and *Cacoecia* species are included along with numerous miscellaneous records. All new host records for a particular parasite are marked with an asterisk.*

DIPTERA

TACHINIDAE

Actia fissicornis (Strbl.). One male and two females bred, 9.viii.1956, from a larva of **Poecilocampa populi* (L.), on birch, Mundford, Norfolk (G.V. Day). Five *Actia* larvae emerged and pupated 23.vi.1956, but only three adults emerged.

Compsilura concinnata (Mg.). One female bred, 21.ix.1937, from

* *Cucullia gnaphalii* (Hb.), Lewes, Sussex (A. J. Wightman). One female bred 14.x.1948 from a larva of * *Sphinx ligustri* (L.), Lechlade, Gloucestershire (A. J. Baxter). Five females bred, ix.1951, from two *Cerura vinula* (L.) larvae (one and four per host), on aspen, Cloweswood, Warwickshire (S. E. W. Carlier). Larva of *Compsilura* emerged and pupated, 4.viii.1951. Two females bred, ix.1951, from a larva of * *Cerura hermelina* (Goeze) on aspen, Cloweswood, Warwickshire (S. E. W. Carlier). The Tachinid larvae pupated 2.viii.1951. From the same host larva two *Apanteles* sp. emerged, 30.vii.1951. This is the first parasite recorded from *C. hermelina*.

HYMENOPTERA

BRACONIDAE

Rogas heterogaster (Wesm.) (all *Rogas* det. R.D.E.). One male bred, 10.vii.1952, from a third instar larva of * *Notodonta dromedarius* (L.) on birch, Cannock Chase, Staffordshire (H.E.H.). Two *Rogas* larvae spun up in the host larval skin 31.viii. 1951, but only one adult emerged.

Rogas unipunctator (Thunb.). One male bred, 29.vi.1951, from a larva of * *Apamea sordens* (Hufn.) (= *basilinea* (Schiff.)) Manchester (R. Warwick). The *Rogas* spun up in the host larval skin 2.xi.1950. One female bred, 30.vi.1951, from a larva of * *Apamea sordens*, Birmingham, Warwickshire (H.E.H.). The *Rogas* spun up in the host larval skin 27.ix.1950. These two records from different localities suggest that *A. sordens* is a regular host of this species.

Rogas ? modestus Rein. Two males bred, 24.vi.1949, one per host larva of * *Eupithecia absinthiata* (Clk.) on *Artemesia absinthium* L., Marston Green, Warwicks. (S. E. W. Carlier).

Rogas testaceus (Spinola). One male bred, 25.ix.1951, from a larva of * *Chloroclystis coronata* (Geyer in Hb.), on *Clematis vitalba* L., West Sussex (H.E.H.). The *Rogas* larva spun up in the host larval skin 8.ix.1951.

Ascogaster nigricornis Thoms. (det. M.W.R. de V.G.). Three males bred, 20.vii.1955, from teazle-heads (*Dipsacus sylvestris* Huds.), Wakerley Wood, Rockingham Forest, Northants (S. E. W. Carlier). From the teazle-heads the following Tortricidae and Eucosmidae emerged: five *Phalonia roseana* (Haw.) (19-25.vii.55), one *Endothenia oblongana* (Haw.) (19.vii.) and one *Endothenia gentianana* (Hüb.) 21.vii.). It is probable that *E. gentianana* was the host species, as Dr. M. W. R. de V. Graham tells us that he has bred *A. nigricornis* from this Eucosmid in teazle-heads in Berks. and Bucks.

Apanteles simulans Lyle (all *Apanteles* det. G.E.J.N.). Eighty adults, bred 15.vii.1951, from three larvae of * *Orthosia gracilis* (Schiff.) (grey form) on *Spiraea ulmaria* L., Pulborough, Sussex (A. J. Wightman). The *Apanteles* larvae spun cocoons 4.vii.1951. One female bred, 2.vi.1954, from a larva of * *Amathes stigmatica* (Hb.), Stoke Ferry, Norfolk (H.E.H.).

Apanteles limbatus Mshll. Ten adults bred, 7-11.vi.1951, from one host larva of *Abraxus grossulariata* (L.) on black currant, Birmingham (G. B. Manly). Eleven *Apanteles* larvae spun up 26.v.1951.

Apanteles praepotens (Hal.). Several bred, iii.1952, one per host larva of * *Eupithecia millifoliata* Rössl., on *Achillea millefolium* L., East Sussex (G. M. Haggett). The *Apanteles* larvae spun cocoons 30.x.1951.

Apanteles glomeratus (L.). Several bred, 3.v.1951, from larvae of *Aporia crataegi* (L.) reared in England from German stock (T. J. Honeybourne).

Apanteles spurius (Wesm.). Numbers bred, 26.vi.1955, from larvae of *Colotois pennaria* (L.), Windmill Naps, Warwicks. (H.E.H.). The *Apanteles* larvae spun cocoons 16.v.1955. One female bred, 11.vi.1954, from a larva of *Poecilocampa populi* (L.), Austy Wood, Warwicks. (H.E.H.). Several bred from a larva of *Biston betularia* (L.) on birch, Kinver, Staffs. (H. T. King). Six bred 30.ix.1953, from a larva of * *Dysstroma truncata* (Hufn.) on birch, Kinver Edge, Staffs. (H.E.H.). Seven *Apanteles* larvae spun cocoons 25.ix.1953, but only six adults emerged. From the date range shown in these records it is obvious that *A. spurius* has at least two broods per year on different hosts.

Apanteles falcatus (Nees). Eighty-two bred, 20.vii.1955, from two host larvae (45 and 37 per host) of * *Hepialus humuli* (L.) taken at roots of *Rumex* sp., Birmingham, Warwickshire (G. P. Sutton). The *Apanteles* larvae spun cocoons 16.vii.1955. This interesting species has previously only been bred from *Xylophasia* (= *Apamea*) *monoglypha* (Hufn.) (*vide* Wilkinson, 1954: 136-7), which also feeds at soil level, but on various grasses.

Apanteles abjectus Mshl. Seven bred, 7.viii.1951, from a half-grown larva of * *Notodonta dromedarius* (L.) on birch, Earlswood, Warwicks. (S. E. W. Carlier). The *Apanteles* larvae spun cocoons 30.vii.1951.

Apanteles immunis (Hal.). A female bred, 12.v.1952, from a larva of * *Eupithecia tantillaria* Bdv., on Austrian pine, Cannock Chase, Staffs. (H.E.H.). The *Apanteles* larva spun up 4.x.1951. A female bred, 30.ix.1952, from a larva of * *Dysstroma truncata* (Hufn.) on birch, Kinver, Staffs. (H.E.H.). The *Apanteles* larva spun up 16.ix.1952. A female bred, 24.ix.1953, from a larva of * *Cosymbia albipunctata* (Hufn.) on birch, Kinver, Staffs. (H.E.H.). The *Apanteles* larva spun up 10.ix.1953. It is interesting to note that only one per host was bred of this *Apanteles*.

Apanteles caberae Mshll. A female bred, 8.vii.1951, from a larva of * *Anticlea* (= *Paracolax*) *derivata* Schiff., on *Rosa canina* L., Austy Wood, Warwicks. (H.E.H.). The *Apanteles* larva spun its cocoon 23.vi.1951.

Apanteles popularis (Hal.). Six bred, 4.vi.1952, from a larva of *Hypocrita* (= *Callimorpha*) *jacobaeae* (L.) on *Senecio jacobaeae* L.,

Chiswick, London (R. W. J. Uffen). The *Apanteles* larvae spun cocoons 18.viii.1951.

Apanteles fraternus Reinh. Many bred, ix.1952, from three larvae of *Euclidimera mi* (Cl.) on various grasses, Dungeness, Kent (A. J. Wightman). The *Apanteles* larvae spun their cocoon-mass 2.ix.1951, the adults emerging towards the end of the month. This species is interesting in that it is the only known Palaearctic *Apanteles* with an alveariform cocoon-mass. Nine bred, 12.x.1955, from a larva of * *Aspitates gilvaria,* Schiff., Dungeness, Kent (H.E.H.). *Apanteles* larvae spun cocoons 20.ix.1955. This species has previously been bred from *Crocota* (= *Aspitates*) *ochrearia* (Rossi) and *Perconia* (= *Aspitates*) *strigillaria* (Hb.) (*vide* Wilkinson 1945 : 142-3).

Apanteles vitripennis (Curt.). Bred, 10.vii.1951, from a larva of * *Chesias legatella* (Schiff.). Tomintoul, Banff. (F. A. Noble). The *Apanteles* larvae spun cocoons 30.vi.1955. A female bred, 8.x.1954, from a larva of * *Eupithecia laraciata* (Frey.) on larch, Llanrwst, N. Wales (H.E.H.). The *Apanteles* larva spun up 23.ix.1954.

Apanteles fulvipes (Hal.). Many bred, 15.iv.1954, from a larva of *Amathes xanthographa* (Schiff.), Kingsnorton, Birmingham, Warwicks. (H. T. King). Many bred, October 1955, from * *Leucania comma* (L.), Dungeness, Kent (H.E.H.). *Apanteles* larvae spun cocoons 20.ix.55.

Apanteles sibyllarum Wilk. Ten bred, 6-10.vi.1952, from a larva of *Limenitis camilla* (L.) on honeysuckle, N. Hampshire (G. E. Hyde). Eleven *Apanteles* larvae spun cocoons 30.v.1952, but only 10 adults emerged.

Apanteles sp. Four males bred, 23.iv.-1.v.1952, from a larva of *Eupithecia pimpinellata* (Hb.) on *Pimpinella saxifraga* L., West Sussex (G. M. Haggett). Since no females were bred it was not possible to determine this *Apanteles* to species. Previously *A. spurius* has been bred from this host (*vide* Wilkinson, 1945 : 48).

Microgester calceatus Hal. (det. G.E.J.N.). One female bred, 8.vi.1955, from a larva of * *Ellapia prosapiaria* (L.) (= *fasciaria* (Schiff.)) on *Pinus sylvestris* L., Kinver, Staffs. (H. T. King). Two *Microgaster* larvae spun cocoons 25.v.1955, but only the one adult emerged. From the same host larva a *Litomastix* sp. also emerged (see below).

Microgaster subcompletus Nees. Several bred, 15.ix.1955, from a larva of *Vanessa atalanta* (L.). Weymouth, Dorset (H.E.H.).

Microplitis spectabilis (Hal.) (all *Microplitis* det. G.E.J.N.). Hundreds bred (average six per host), 14-19.v.1955, from a larva of * *Apamea unanimis* (Hb.) on *Digraphis arundinacea* (L.), Birmingham, Warwicks. (H.E.H. and A. J. Wightman). The host larva appeared healthy after hibernation from x.1952 to iv.1953, when signs of parasitism appeared. From 20.iv. to 2.v.1953 the *Microplitis* larvae emerged and spun cocoons in the grass stem.

Microplitis tristis (Nees). Eleven bred, 16-24.vii.1950, from a larva

of *Hadena bicruris* (Hufn.) on *Lychnis dioica* L., Dover, Kent (H.E.H.). Fourteen parasite larvae spun cocoons 6.vii.1950, but only 11 adults emerged.

Microplitis eremita Rein. A female bred, 10.v.1952, from a larva of * *Notodonta dromedarius* (L.) on birch, Doncaster, Yorks. (H.E.H.). The *Microplitis* larvae spun cocoons 27.ix.1951. A female bred, 5.v.1952, from a larva of * *Apatele psi* (L.) on birch, Clowes-wood, Warwicks. (H.E.H.). Parasite larvae spun up 19.ix.1951.

Microplitis mediator (Hal.). A female bred, v.1953, from a larva of * *Triphaena janthina* (Schiff.) on Hawthorn, Arundel, Sussex. Parasite larvae spun cocoons 30.iv.1953. Two bred, 28.vi.1951, from a larva of * *Orthosia miniosa* (Schiff.) on oak, West Sussex (H.E.H.). Parasite larvae spun cocoons 12.vi.1951.

Microplitis tuberculifer (Wesm.). One bred, 26.v.1951, from a larva of * *Ligdia adustata* (Schiff.) on *Euonymus europaeus*, Sampford Peverell, near Tiverton, Devon (F. H. Lyon). The *Microplitis* larva spun its cocoon in early October. The only parasite previously recorded from this host is *Meteorus deceptor* (Wesm.). One female bred, October 1951, from a larva of * *Eupithecia icterata* (Vill.) ssp. *subfulvata* (Haw.), West Sussex (G. M. Haggett). This species has also been recorded from other *Eupithecia* species.

Microplitis sp. Two bred, 4.vii.1949, from * *Eupithecia absinthiata* (Cl.), Marston Green, Warwicks. (S. E. W. Carlier).

Macrocentrus abdominalis (F.) (det. R.D.E.). Two males bred vii.1952, one per host of * *Cacoecia lecheana* (L.) on apple, Guilden Sutton, Cheshire (K.G.V.S.). *M. abdominalis* has previously been recorded from other *Cacoecia* species.

Macrocentrus marginator (Nees) (det. K.G.V.S.). Two females bred (one per host) from * *Ypsolophus parenthesellus* (L.) (= *costellus* (F.)) on oak and hazel, Austy Wood, Warwicks. (S. E. W. Carlier).

Macrocentrus collaris (Spin.) (det. R.D.E.). Four hundred and fifty-three bred (95 males, 358 females), 6-8.viii.1953, from seven host larvae (average 65 per host) on *Antitype xanthomista* (Hb.) on *Anthyllis vulneraria* L., Porthallow, Cornwall (G. E. L. Manley). The parasite larvae spun up 14.vii.1953.

Meteorus caligatus (Hal.) (all *Meteorus* det. G.E.J.N.). Seven bred, 8.viii.1953, from three larvae of *Eupithecia goossensiata* (Mab.) on *Calluna vulgaris* L., Swaffham, Norfolk (H.E.H.). The *Meteorus* larvae spun up mid-October, 1952.

Meteorus deceptor (Wesm.). One female bred, 30.ix.1953, from a larva of * *Euphyia cuculata* (Hufn.), Arundel, Sussex (G. M. Haggett).

Meteorus pulchricornis (Wesm.). One female bred, vii.1953, from a larva of * *Orthosia cruda* (Schiff.), Austy Wood, Warwicks. (H. T. King). Two *Meteorus* larvae (from the one host larva) spun cocoons 20.vi.1953, but only one adult emerged.

ICHNEUMONIDAE

Chasmias paludator Desv. (= *paludicola* (Wesm.)) (Ichneumonidae det. J.F.P. unless otherwise stated). One male bred, 8.ix.1951, from a pupa of * *Nonagria sparganii* (Esp.) in Reed-Mace (*Typha* sp.), West Sussex (G. M. Hagget). This parasite has been recorded from other *Nonagria* species (*vide* Morley and Rait-Smith, 1933).

Amblyteles palliatorius (Grav.). One male bred, 20.vi.1951, from a pupa of * *Amathes ashworthii* Dbld., North Wales, on *Calluna vulgaris* L. (T. J. Honeybourne).

Hypomecus quadriannulatus (Grav.) (det. G.J.K.). One female bred, 25.ix.1951, from a pupa of * *Dysstroma truncata* (Hufn.), West Sussex (G. M. Haggett).

Hemiteles areator (Panz.) (det. G.J.K.). Almost certainly a hyperparasite on one of the primary parasites of *Cacoecia lecheana* (L.) recorded elsewhere in this paper. One female emerged vii.1952, Ince, Cheshire (K. G. V. Smith).

Pimpla instigator (F.) (det. K.G.V.S.). One male 6.v.1955 and one female 13.v.1955, each bred from a pupa (one per host) of * *Calaphasia lunula* Hufn., Dungeness, Kent, on *Lunaria vulgaris* Mill. (L. Christie). One female bred, 26.viii.1944, from a pupa of * *Deilephila elpenor* (L.), Birmingham, Warwicks. (H.E.H.).

Lissonota palpalis Thoms. Four females bred, 20.vii.1954, from * *Ypsolophus costellus* F., Austy Wood, Warwicks. (S. E. W. Carlier) (see Introduction).

Enicospilus repentinus (Holmgr.) (det. K.G.V.S.). One bred from a larva of * *Agrotis ripae* (Hb.), Porthcawl, Glamorgan (A. J. Wightman). Four bred 21-25.vii.1953 (one per host) from larvae of * *Agrotis ripae,* West Wittering, Sussex (G. E. L. Manley). The host of *E. repentinus* was previously unknown, but from these two independent records it appears that *A. ripae* is a regular host. Other species of *Enicospilus* have been bred from various lepidoptera (*vide* Morley and Rait-Smith, 1933).

Heteropelma calcator Wesm. One female bred, 1.vii.1951, from * *Polychrisia moneta* (F.) on Delphinium, Birmingham (G. B. Manly).

Aphanistes xanthopus (Schrk.). One male and one female bred, 10.ix.1951, from pupae (one per host) of *Panolis flammea* (Hb.), on Scots pine, Lancashire (T. J. Honeybourne).

Blaptocampus nigricornis (Wesm.) (det. G.J.K.). One female bred, vii.1952, from * *Cacoecia lecheana* (L.) on apple, Guildon Sutton, Cheshire (K.G.V.S.).

Labrorychus flexorius (Thunb.). One male bred, 1.vi.1953, from a pupa of *Hadena bicruris* (Hufn.), Birmingham (H. T. King). One female bred, 26.v.1953, from a pupa of *Drepana lacertinaria* (L.) on birch, Cannock Chase, Staffs. (S.E.W.C.). Female bred, 29.v.1953,

from a pupa of * *Bupalus piniarius* (L.), Scots pine, Cannock Chase, Staffs. (S.E.W.C.).

Campoplegidea myrtillus (Desv.) (det. G.J.K.). One female bred, 5.v.1952, from * *Orthosia* (*populeti*) *populi* (Stroem), Lynford, Norfolk (G. M. Haggett).

Campoplegidea sp. One female bred, 28.v.1952, from *Ectropis crepuscularia* (Hb.) on birch, Cloweswood, Warwicks. (H.E.H.). The parasite larva spun its cocoon 20.vii.1951.

Campoplex (= *Omorgus*) *mutabilis* Hlgr. (det. G.J.K.). One female bred, 16.vi.1952, from * *Cacoecia* (*podana*) *oporana* (L.), on apple, Guildon Sutton, Cheshire (K.G.V.S.).

Campoplex (= *Omorgus*) *picticruris* Thoms. Three females bred, 16.vii.1954, from * *Ypsolophus* (*Cerastoma costellus*) *parenthesellus* (L.). Host larva from hazel and oak, Austy Wood, Warwicks. (S.E.W.C.) (see Introduction).

Casinaria morionella Hlgr. Two females bred, 24.vi.1949, one per host pupa of *Eupithecia absinthiata* (Clk.) on *Artemisia absinthium*, Marston Green, Warwicks. (S. E. W. Carlier).

Phobocampe crassiuscula (Grav.) (det. G.J.K.). One female bred, ix.1952, from * *Bapta punctata* (F.) (= *temerata* (Schiff.)), Arundel, Sussex (G. M. Haggett).

Anilastus (= *Anilasta*) sp. One female bred, 11.vi.1951, from a larva of * *Hypena proboscidalis* (L.), Lynford, Norfolk (H.E.H.). Parasite larva spun cocoon 29.v.1951. *A. braccatus* (Gmel.) is recorded from *Hypena rostralis* (L.) (*vide* Morley and Rait-Smith, 1933), but no *Anilastus* has previously been bred from *H. proboscidalis*.

Paniscus (= *Parabetes*) *virgatus* (Fourc.). Two *Paniscus* larvae were found feeding externally, one on each of two larvae of * *Hydriomena impluviata* (Schiff.)) (= *coerulata* (F.)) on aspen, Windmill Naps, Warwicks., in October, 1955 (H. T. King and F. A. Noble). The parasite larvae spun cocoons 10.x.1955, and one adult *P. virgatus* emerged 15.xi.1955. For notes on the life-history of this interesting species see Morley (1914 : 291-2) and Stenton (1910).

ENCYRTIDAE

Copidosoma sp. near *flagellare* (Dalm.) (det. R.D.E.). Thirty-seven males bred, 24.vii.1954, from one pupa and 183 females bred 29.vii.1954 from five pupae of * *Ypsolophus parenthesellus* (L.), Austy Wood, Warwicks. (S. E. W. Carlier).

Litomastix sp. near *quercicola* Merc. (det. M.W.R.deV.G.). Thirty-seven females bred, vii.1952, from a larva of * *Eupithecia trisignaria* H.-S., feeding on seeds of wild carrot, West Sussex (G. M. Haggett). The parasites spun up in the host larval-skin 9.x.1951. Seventy-seven males bred 10.vii.-13.vii.1951 from two larvae of * *Eupithecia succenturiata* (L.) on wormwood, Redditch, Worcs. (F. H. Latham).

Litomastix spp. Two hundred and forty-four bred, 9.vii.1952, from five larvae of * *Eupithecia expallidata* Dbld., on wild goldenrod, West Sussex, x.1951 (G. M. Haggett). Thirty-six bred,

20.vii.1951, from a larva of *Epirrhoe alternata* (Müll.) on hedge bedstraw, Redditch, Worcs. (F. H. Latham). Seven bred from a larva of * *Eupithecia tripunctaria* H.-S. on wild-parsnip, Folkestone, Kent (R. W. J. Uffen). The host skin obviously contained far more parasites than actually emerged. Eleven bred, 8.vi.1955, from a larva of * *Ellopia fasciaria* L. on Scots pine, Kinver, Worcs. (H. T. King). From this same larva two larvae of *Microgaster calceatus* Hal. had emerged as discussed above.

Tyndarichus scaurus (Walk.) (det. M.W.R.deV.G.). Twenty-one bred, 24.vii.1954, from a pupa of * *Ypsolophus parenthesellus* (L.). The host larvae were collected from hazel and oak, Austy Wood, Warwicks. (S. E. W. Carlier) (see Introduction).

PTEROMALIDAE

Pteromalus puparum (L.) (det. G.R.G.). Fifty-eight bred, 15.vi.1954, from a pupa of *Aglais urticae* (L.), Birmingham (R. J. Cooke). We have also bred this species from a pupa of *A. urticae* sent by Mr. H. T. King, from Tunbridge Wells, Kent.

Psychophagus omnivoras (Walk.) (det. M.W.R.deV.G.). One hundred and fifty bred, v.1946, from a pupa of * *Saturnia pavonia* (L.), ex. Yorkshire stock (K.G.V.S.). The adult parasites emerged from the host pupa through three holes; in the side of the head, side of the thorax and tip of the abdomen.

EULOPHIDAE

Eulophus (= *Comedo*) sp. near *larvarum* (L.) (det. G.R.G.). Twenty-one bred from a larva of * *Apatele leporina* (L.). The parasite larvae emerged from the host larva and pupated alongside its remains, on the leaf, 5.viii.1954. Host larvae on birch, Stoke Ferry, Norfolk (G. V. Day). Nine bred, 26.iv.-1.v.1952, from a larva of * *Apatele leporina* (L.) on birch, West Sussex (A. J. Wightman). Sixteen parasite larvae emerged and pupated 15.ix.1951, but only nine adults emerged. Three bred, 29-30.iv.1952, from a *second-instar* larva of * *Lophopteryx capucina* (L.) on lime, Birmingham, Warwicks. (H.E.H.). Parasite larvae emerged and pupated 20.ix.1951. Seven bred, 1-5.iv.1953, from a larva of * *Diataraxia oleracea* (L.) from Pulborough, Sussex (A. J. Wightman). Thirteen parasite larvae emerged and pupated 17.ix.1952, but only seven adults emerged. Four bred, 12.iv.-6.v.1956, from a larva of * *Colocasia coryli* (L.) on beech, Tring, Herts. (F. A. Noble). Seventeen parasite larvae emerged and pupated, but only four adults emerged. This species has proved new to science and will be described by G. R. Gradwell (in press, *Ent. mon. Mag.*).

SCELIONIDAE

Telenomus punctatissimus Mayr. (det. G.E.J.N.). Forty-five bred, 25.viii.1951, from 32 ova of *Phalera bucephala* (L.) on willow, Pulborough, Sussex (A. J. Wightman).

Telenomus bombycis Mayr. (det. G.E.J.N.). One hundred and fifty

bred, 2-5.vii.1952, from 19 ova of *Lasiocampa quercus* (L.), Hod Hill, Dorset (R. W. Watson).

ACKNOWLEDGMENTS

We would like to thank all these correspondents who have sent parasites or larvae from which we have subsequently bred parasites, each fully acknowledged in the text.

For determinations and confirmations of the Hymenoptera we thank Messrs. R. D. Eady, G. R. Gradwell, Dr. M. W. R. de V. Graham, Messrs. G. J. Kerrich, G. E. J. Nixon and J. F. Perkins (all acknowledged by initials in the text). The Diptera and some Hymenoptera were named by K.G.V.S., the Lepidoptera by H.E.H.

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H. E. HAMMOND,
16 Elton Grove,
Acocks Green,
Birmingham 27.

K. G. V. SMITH,
Hope Dept. of Entomology,
University Museum,
Oxford.

AN EARLY RECORD OF *HELIOTHIS PELTIGERA* (SCHIFF.) LEP: CARADRINIDAE

A male specimen of *H. peltigera* was taken in the light trap in my garden on the night of 23rd-24th March, 1957.

R. I. LORIMER.

8 Southway,
Totteridge, N.20.

SOME SUPPLEMENTARY NOTES ON *XANTHORHOË BIRIVIATA* BKH. (LEP: GEOMETRIDAE)

By W. E. MINNION

In the *Ent. Gaz.*, 1956, **7**: 3-6, Mr. Goodban and I described our discovery of this moth and our subsequent experiences with the species.

At the time, the locality in which it was found appeared to be very limited, but it is now established that the insect occurs over a considerable area in two counties and possibly in two more. In our original paper we appealed to anyone finding the moth to advise the Editors of the locality on the understanding that the locality would not be divulged. This appeal is reiterated as it is only by some such arrangement that an accurate picture of the distribution of the insect can be built up.

We first found the moth on 31st May, 1955. This, it is thought, will have conveyed a wrong impression. In 1956 the moth was out in numbers on 12th May and worn specimens were present, though the bulk of them were fresh. An earlier and previously unidentified capture of the moth has been discovered for late April, 1951, evidence that one should commence to look for the species from the last two weeks of April. From the beginning of May until August there is evidently always a chance of the moth being on the wing. A gap between broods appears to occur around the beginning of July.

Further evidence of the insect's diurnal habit has appeared. In captivity moths usually emerged in the early morning and were paired when looked at in the evening. Confirmation of this was obtained in part by field observation on 12th May. The day had been mainly dull and cool and many *biriviata,* quite fresh, were discovered on trunks of Spruce with which their colour harmonizes very closely, in pairs a few inches apart, while one or two pairs were 'in cop'. In my experience this is an unusual discovery among 'carpets'. Several moths were flying during the early evening but the dusk flight was poor. An entirely different situation obtained on 15th May when the evening was warm and sunny and the moths were most active. Whenever I have looked for the moths on a sunny afternoon or evening they have been flying freely and rather difficult to catch in the broken sunlight of the wood. It has been suggested that the moth is inactive in the morning, but I have not been able to verify this from personal observation.

On 16th May during afternoon sunshine Mr. J. M. V. Saunders observed females ovipositing on the *Impatiens*. They appear to alight on the edge of a leaf and lay the egg at the length of the abdomen from the edge on the underside. We reported that in captivity ova

were laid in small groups, but from field observations it would appear that the normal habit is to lay singly. The ova were found in the wild during May on the lower surfaces of the higher leaves of the young plants.

Compared with the spring emergence, the summer brood was poor in 1956. Many ova were obtained from spring females, but all those who tried to rear the summer brood moths found that very few emerged. Of fifty pupae which I obtained none produced summer moths. Many coloured up but have not emerged, but at the time of writing (February) a large proportion of my pupae are still alive and will, I hope produce spring moths. This behaviour suggests that the summer brood is only partial.

These additional notes are put forward in the hope that they will assist others to discover the species in various localities and that they will reciprocate by advising the Editors of their discoveries. It would seem to be worth while exploring the possibility of the moths occurrence anywhere that *Impatiens* species grow freely. It does seem, however, that some shade is a necessary feature of localities favoured by the species.

LARVAE OF *HELIOTHIS ARMIGERA* (HB.) IN BIRMINGHAM (LEP: CARADRINIDAE)

On 4.4.1957 my greengrocer gave me a Canary Island tomato containing a small larva of *H. armigera*. This I fed on tomato and orange until the last moult, when I introduced groundsel. From that point it refused to eat anything else until fully grown, when I preserved the skin. This was of the green form with the usual red-brown markings.

On the 20th a further specimen came to hand from H. T. Iling, F.R.E.S., who was so very kind in allowing me to keep it. This specimen was in tomato throughout and I was particularly pleased, as it was of the dark red-brown form with buff ground-colour.

The first was found at Acocks Green, Birmingham. The second at Stirchley, Birmingham, both from Canary Islands tomatoes.

H. E. HAMMOND.

16 Elton Grove,
Birmingham, 27.

LARVAE OF *HELIOTHIS ARMIGERA* (HB.) IN MIDDLESEX (LEP: CARADRINIDAE)

In view of Mr. Hammond's note above it may be worth while to place on record that I have had two larvae of *H. armigera* during

the last month (March-April, 1957). The circumstances are similar. Both were feeding on the fruit of Canary Islands tomatoes and were given to me by my greengrocer. One larva was killed by being dropped whilst being carried home by my wife, the other was sent to Mr. G. Haggett for figuring and was unfortunately killed in the post. It had not been long dead on arrival and was preserved. The import of larvae of this species is probably quite common at this time of the year (I have seen a number of specimens over the years), but the vast majority must be destroyed by zealous and irate tradesmen.

E. W. CLASSEY.

Feltham, Middlesex.

MERCURY VAPOUR LAMP TECHNICALITIES

Two recent experiences, not covered by Mr. Robinson's two very informative articles on this subject, are worth recording; one because it may help others and the other because I need advice, and if that advice appears in your columns, others may also benefit.

For field work small petrol generating sets are well known. They are noisy, often reluctant to start, and heavy to lift back into the car single-handed in the early hours of the morning. I have operated very successfully with a rotary converter using the car battery. The particular equipment requires an input of 12 volts DC and gives an output of 200-240 volts at 50 cycles AC with a power of 150 watts available. This is enough to run a 125-watt M.V. lamp provided that the appropriate condenser is included to correct the power factor. It draws about 16 amps. from the battery and I have run for two-three hour periods and then started with the self-starter; some four to five hours' motoring is needed to recharge the battery unless a charger is available in the garage. The converter cost £9, which compares favourably with a petrol generator.

When in the Lake District last Summer we spent some time selecting a country hotel which appeared well sited for M.V. trap operations. Only at dusk when preparing to connect up the equipment did I realize that the supply was a local one and was 110 volts DC so that the choke could not be used. I had no suitable resistors with me, nor do the articles specify the value required; the rotary converter was pressed into service. As many outlying places have DC supplies of this type, the travelling entomologist should be properly equipped. I hope this note will save others from a similar experience, and that you will find space to advise us all what value of resistance should be used and what power it must be capable of dissipating.

C. I. RUTHERFORD

Red Roofs,
Oakdale,
Harrogate.

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